Government Actuary's Department

Periodic review of rules about State Pension age

Report by the Government Actuary

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To: Richard Harrington MP
Parliamentary Under Secretary of State for Pensions

I am pleased to present a report analysing whether those reaching State Pension age (SPa) in a specified future period can expect to spend specified proportions of adult life in receipt of state pension based on the current legislated timetable and, if not, how the SPa timetable should change to deliver that. This report is made in accordance with section 27(4) of the Pensions Act 2014 and in line with the Terms of Reference attached to your letter dated 16 November 2016. I understand that this report will be laid before Parliament under section 27(6) of the Pensions Act 2014.

Martin Clarke FIA
Government Actuary

23 March 2017

Contents

1 Executive summary

1.1 I have prepared this report for the Secretary of State for Work and Pensions under the requirements of section 27(4) of the Pensions Act 2014 to consider "whether the rules about pensionable age mean that, on average, a person who reaches pensionable age within a specified period can be expected to spend a specified proportion of his or her adult life in retirement, and, if not, ways in which the rules might be changed with a view to achieving that result". For this purpose, "pensionable age" has the same meaning as "State Pension age" (SPa), which is the term used throughout this report (and which is always shown in complete years in this report).

1.2 The key assumptions and parameters that I have been instructed to use in my report are that the assumed mortality rates (the probability of dying at any given age) will be in line with the 2014-based UK principal population projections produced by the Office for National Statistics (ONS), and that adult life is assumed to begin at age 20. I have been asked to consider changes to the SPa timetable over the period from 2028 to 2064 only. For the specified proportion of adult life in retirement – that is, the percentage of adult life that someone who reaches SPa will be in receipt of their State Pension – I have been requested to consider two scenarios, namely 33.3% and 32.0%.

1.3 The table below shows the years in which SPa is due to change under current legislation, and the changes to the SPa timetable that would be required to meet the requirements under each of the two scenarios described above based on the specified assumptions and parameters over the period from 2028 to 2064 (SPa changes are assumed to take place over two-year periods commencing on 6 April). This shows that over the projection period from 2028 to 2064 there would need to be two increases in SPa under the 33.3% scenario and three increases under the 32.0% scenario.

Table 1: *Calculated SPa timetables under specified parameters and assumptions, 2028 to 2064 – years of SPa changes*

SPa changes	Current legislation	33.3% scenario	32.0% scenario
67 to 68	2044-46	2039-41	2028-30
68 to 69	n/a	2053-55	2040-42
69 to 70	n/a	n/a	2054-56

1.4 The table below illustrates how the calculated SPa timetables outlined above will impact upon individuals based on their dates of birth.

Table 2: *Calculated SPa timetables under specified parameters and assumptions, 2028 to 2064 – dates of birth for affected individuals*

Date of birth		SPa under current legislation	SPa under 33.3% scenario	SPa under 32.0% scenario
From	**To**			
6 April 1961	5 April 1962	67	67	67 to 68*
6 April 1962	5 April 1972	67	67	68
6 April 1972	5 April 1973	67	67 to 68*	68 to 69*
6 April 1973	5 April 1977	67	68	69
6 April 1977	5 April 1978	67 to 68*	68	69
6 April 1978	5 April 1985	68	68	69
6 April 1985	5 April 1986	68	68 to 69*	69 to 70*
6 April 1986	onwards**	68	69	70

* Transitional period - SPa for people born in this period will be somewhere in the range indicated

** This report only considers SPa changes between 6 April 2028 and 5 April 2064

1.5 Under both scenarios, the rate of growth of the old age dependency ratio – which measures the proportion of people above SPa compared to the number of people of working age – will decrease to some extent, but the ratio itself is still expected to increase significantly from its current levels over the projection period.

1.6 Whilst the calculations are based on the percentage of adult life that someone who reaches SPa will be in receipt of their State Pension, some people will die before reaching SPa. My calculations show that the probability of individuals surviving from the start of adult life to SPa is gradually expected to increase over time, from a level of around 88% in 2020 to somewhere above 90% by the end of the projection period in 2064, under either scenario, despite the increases to SPa projected to occur during this period. This reflects the expected continuing future improvements in longevity rates over the projection period.

1.7 The calculated SPa timetables outlined above are highly sensitive to both the assumptions and experience in the calculation of future life expectancies. The estimates in this report cover a very long time period and, as such, there is considerable scope for variation at successive SPa reviews. Changes in the ONS population projections (which are updated every two years) can have a large impact on the calculated proportion of adult life in retirement. My analysis shows that:

- if the ONS 2010- or 2012-based principal population projections were used instead of the 2014-based projections, the calculated timetable for SPa increases over the projection period could move by up to 8 years;
- if the long-term mortality improvement rate assumed by ONS, which is currently 1.2% per annum (pa) at most ages, was changed by 0.2% pa in either direction, the calculated timetable for SPa increases over the projection period could move by up to 10 years;

> combinations of the two effects above – that is, differences in successive sets of ONS principal population projections along with a change in the long-term mortality improvement rate – could therefore have an even greater effect on the calculated SPa timetables.

1.8 The government has already sought to address the risks of unexpected SPa increases by providing a stated intention that it will give at least 10 years' notice of any such changes. There are challenges associated with setting future SPa increases too far into the future, such that they might not reflect successive, more contemporary, ONS population projections, and therefore that a balance is needed between providing sufficient notice of future changes and of changing future expectations.

1.9 It should be recognised that the government has not committed to follow either the 33.3% or 32.0% scenarios set out in this report, and is considering future changes to SPa timetables in the context of both this report and the separate independent report being prepared by John Cridland. The final decision on any changes to SPa timetables may therefore be different from any of the scenarios in this report, and may allow for other considerations.

2 Purpose and scope of report

2.1 Under section 27 of the Pensions Act 2014 (see Appendix A to this report), the Secretary of State for Work and Pensions must review the rules about SPa and prepare and publish a report on the outcome of the review. The first such report must be published before 7 May 2017, with subsequent reports published within 6 years of the previous one.

2.2 Section 27(4) states the following:

> *For the purposes of each review, the Secretary of State must require the Government Actuary or Deputy Government Actuary to prepare a report for the Secretary of State on–*
>
> > *(a) whether the rules about pensionable age mean that, on average, a person who reaches pensionable age within a specified period can be expected to spend a specified proportion of his or her adult life in retirement, and*
> >
> > *(b) if not, ways in which the rules might be changed with a view to achieving that result.*

2.3 This document represents the report by the Government Actuary required under this legislation in respect of the first such review, which must be laid before Parliament. I have been asked to include in this report:

- commentary on trends in life expectancy data;
- a timetable regarding future SPa changes;
- impacts on old age dependency ratios;
- appropriate sensitivity analysis.

2.4 The methodology and assumptions that I have been asked to use for this report, and a number of variables and parameters that feed into this, have been specified by the Secretary of State and are set out in the Terms of Reference for this report, which are set out in Appendix A to this report.

2.5 It should be noted that as this is the first report by the Government Actuary under the Pensions Act 2014 legislation, there are no previous equivalent reports for comparison. The legislation requires the Government Actuary (or Deputy Government Actuary) to provide a report for each review of SPa, and therefore a new report equivalent to this one will be expected to be published as part of the next review, by 2023 or earlier.

2.6 This report focuses specifically on the requirements of the Pensions Act 2014 and the Terms of Reference and does not consider the numerous wider issues which are also relevant to the review of SPa, or any knock-on effects from changing SPa timetables that may arise in other areas. These wider issues are the subject of the separate independent review being prepared by John Cridland (for which an interim report was published in October 2016[1]). In this report I have generally commented only on the mathematical and statistical aspects of the increase to SPa and the evidence for it.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/559943/independent-review-of-the-state-pension-age-interim-report.pdf

3 Background to State Pension age

3.1 SPa is the earliest age at which individuals can commence payment of their State Pension. From the 1940s until April 2010, the SPa was 60 for women and 65 for men. Since then, SPa has started changing to allow for:

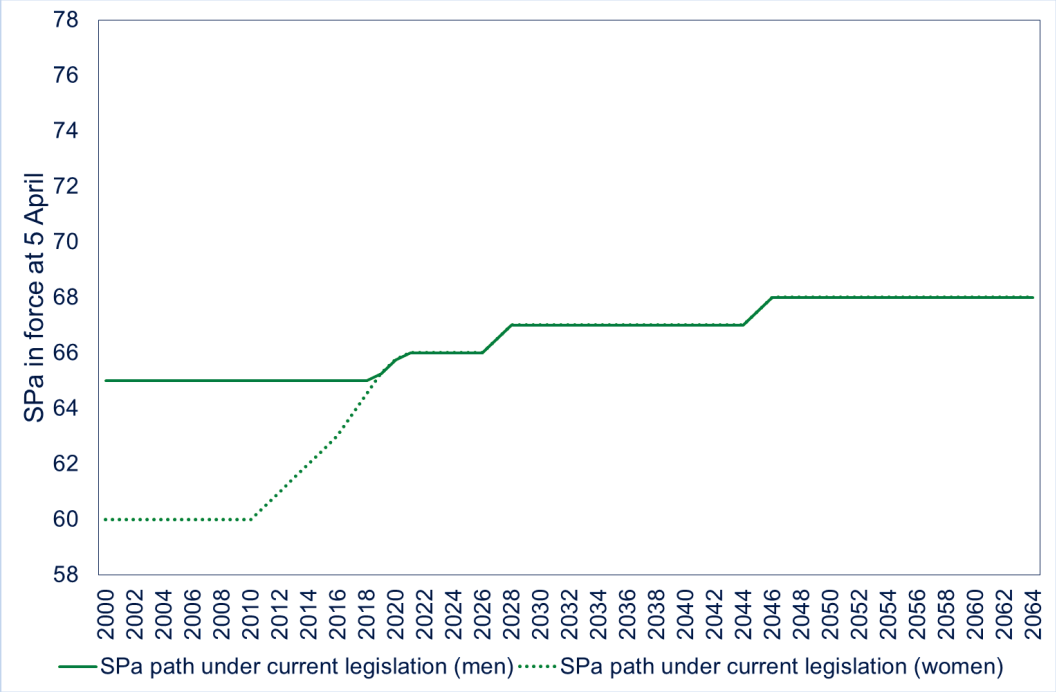
- equalisation of SPa for men and women – legislation to equalise SPa was first introduced in the Pensions Act 1995 (with timetables subsequently amended) and is currently due to be completed by November 2018, at which point SPa will be 65 for both men and women;
- increases to SPa for both men and women – legislation to increase SPa for both men and women was first introduced in the Pensions Act 2007 (again with timetables subsequently amended), and is currently due to commence from December 2018.

3.2 Current legislation provides for increases to SPa in the following timescales:

- increase to SPa for women to 65 – by November 2018;
- increase to SPa for men and women from 65 to 66 – between December 2018 and October 2020;
- increase to SPa for men and women from 66 to 67 – between April 2026 and March 2028;
- increase to SPa for men and women from 67 to 68 – between April 2044 and March 2046.

3.3 The chart below summarises how the SPa has changed in recent years and how it is expected to change in the future under currently enacted legislation.

Figure 1: *SPa path under current legislation, 2000 to 2064*



3.4 In the Autumn Statement 2013, the government announced a core principle underpinning future SPa rises that people should expect to spend, on average, up to one third of their adult life drawing a State Pension and noted that "in order to be able to afford a generous State Pension system it is important that the State Pension age rises in line with increases in life expectancy". Alongside this, the Department for Work and Pensions (DWP) published guidelines for future reviews of SPa in the document 'Autumn Statement announcement on a core principle underpinning future State Pension age rises: DWP background note'.[2]

3.5 Section 27 of the Pensions Act 2014 (see Appendix A to this report) introduced a regular and structured method for considering future changes in SPa, having regard to life expectancy and other relevant factors.

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263660/spa-background-note-051213_tpf_final.pdf

4 Specified parameters

4.1 Section 27(4) of the Pensions Act 2014 requires a number of parameters to be set by the Secretary of State for the purposes of the calculations included in this report. Details of these parameters are set out below.

Specified age

4.2 The "specified age" is the age at which a person's adult life is assumed to begin. I have been instructed that age 20 should be used for the purposes of this report, as this is the OECD convention and commonly used as a comparator for matters relating to pensions.

Specified period

4.3 The "specified period" is the period during which people will reach SPa which is covered in the report. I have been instructed that the specified period for this report should cover people reaching SPa from April 2028 onwards, as far as 2064 (which is as far as cohort-based life expectancy projections are available from the ONS).

4.4 The start date for the specified period covered by this report is consistent with the government's stated intention that it will give at least 10 years' notice of any change to SPa. Therefore, the government's review does not cover the existing timetables for the equalisation of SPa for men and women to 65 (due to complete by November 2018), or the rise in SPa for both men and women to 66 (by October 2020) and then to 67 (by March 2028) and will not make any recommendations for changes to happen before 2028.

4.5 However, the timetable for the increase in SPa from 67 to 68, currently scheduled to take place between April 2044 and March 2046, could change following this review.

Specified proportion of adult life in retirement

4.6 I have been instructed that the "specified proportion of adult life in retirement" – that is, the percentage of adult life that someone who reaches SPa will be in receipt of the State Pension – is expressed as:

$$\frac{\text{life expectancy at SPa}}{\text{life expectancy at SPa } \textit{plus} \text{ SPa } \textit{minus} \text{ specified age}}$$

4.7 It should be recognised that this proportion applies to those people who actually survive to reach SPa. This means that for the adult population as a whole, less than the specified proportion of time will be spent in retirement, once allowance is made for people who die before reaching SPa.

4.8 For the purposes of this report I have been instructed to consider two scenarios for the specified proportion of adult life in retirement:

(i) 33.3% – DWP have stated that this is the maximum possible under the 'up to a third' principle (see paragraph 3.4), is the same as the assumption that the Office for Budget Responsibility have used in spending projections since 2013, and broadly reflects the average proportion of their adult life people reaching age 65 (current male SPa) in the last 10 years were expected to spend above this;

(ii) 32.0% – DWP have stated that this broadly reflects the average proportion of their adult life people reaching age 65 (current male SPa) in the last 20 years were expected to spend above this.

4.9 Further detail on the figures used for life expectancy at SPa is set out in section 5 of this report.

Geographical coverage

4.10 I have been instructed that the analysis in this report should be for the United Kingdom as a whole.

Methodology

4.11 The proposed methodology for future SPa increases provides that SPa should complete any increase in the year in which the specified proportion of adult life in retirement (to the nearest 0.1%) at the existing SPa is first reached.[3]

4.12 One aspect of this methodology is that the calculated proportion, based on the relevant assumptions, will never quite reach the defined specified proportion of adult life in retirement. This is because the SPa will be changed over the two-year period leading up to when the proportion of adult life in retirement would have reached the specified proportion had the SPa not been changed. Therefore, on average, people who reach SPa will be expected to spend a proportion of adult life in retirement which is below the specified proportion.

4.13 For the purposes of the calculations set out in this report, I have been instructed that I should assume the government would adopt an equivalent phasing-in process to that in place for the legislated increase of SPa from 66 to 67, which takes place over two years from April 2026 to March 2028, for any future increases to SPa, and that these transitions will take place over two-year periods commencing on 6 April. Therefore, I have assumed that the transition of SPa from 67 to 68 would begin two years before the year in which the proportion of adult life spent drawing a State Pension at 67 first reaches the specified proportion of adult life in retirement (but no earlier than April 2028).

[3] DWP have confirmed that the rounding to the nearest 0.1% only applies to the specified proportion of adult life in retirement, and not to the calculated proportion in each individual year. For example, under the 33.3% scenario, if the calculated proportion in a particular year was 33.29%, this is deemed to be below the specified proportion of 33.3% and would not be rounded up.

4.14 I have been instructed that life expectancies are based on the age exact as at the middle of the calendar year that falls in the tax year in question. In practice, this means that the calculations for each tax year are carried out based on life expectancies, proportions of adult life in retirement, and the SPa in force, at 30 June in that year. At each point when the specified proportion of adult life in retirement is reached, for the existing SPa, the calculated SPa timetable is then amended so that it completes any increase at 5 April in that calendar year.[4]

[4] For example, if the specified proportion of adult life for the existing SPa was reached in the 2045-46 tax year, based on calculations carried out as at 30 June 2045, the calculated SPa timetable would be set so that the increase to the next SPa would take place between 6 April 2043 and 5 April 2045.

5 Life expectancy assumptions

5.1 I have been requested to include a commentary on trends in life expectancy data in this report. This section therefore discusses this issue, along with background information on mortality projection methodologies, detail on the mortality assumptions I have been instructed to use for my calculations, and commentary on other mortality projections.

Mortality projection methodologies

5.2 Mortality rate projections are generally based on extrapolation of past trends in rates of mortality improvement, with expert opinion used to inform the assumptions made about future rates of improvement in the longer term.

5.3 Life expectancies can be produced on either a "period" basis, which looks at mortality rates for a given period only with no assumptions made about future changes thereafter, or a "cohort" basis, which use age-specific mortality rates allowing for projected changes in mortality rates in later years (and which is more subjective as it requires assumptions regarding unknown future improvements in mortality rates).

5.4 Projections of life expectancies on a cohort basis usually exceed those on a period basis. This is because mortality rates are generally expected to fall in the future, as they have been falling fairly consistently over the last century or so. The most recent (2014-based) population projections of UK life expectancy published by ONS showed that cohort life expectancy at age 65 is currently about two years higher than period life expectancy at age 65.

5.5 Given the context of this report, with projections of life expectancy required over a long future period, I have been informed that the government considers it appropriate to allow for projected future improvements in mortality rates, and instructed that the cohort method be used for the purposes of this report. This is consistent with a report issued by the Pensions Commission in 2005[5] which recommended that official publications use the cohort measurement of life expectancy when describing current and future trends in longevity.

Specified assumptions

5.6 The Terms of Reference for this report (see Appendix A) state that that the government believes that the principal projections of UK population cohort life expectancy, published by ONS every two years, are the appropriate ones for the purposes of this report.

[5] http://webarchive.nationalarchives.gov.uk/+/http:/www.dwp.gov.uk/publications/dwp/2005/pensionscommreport/main-report.pdf

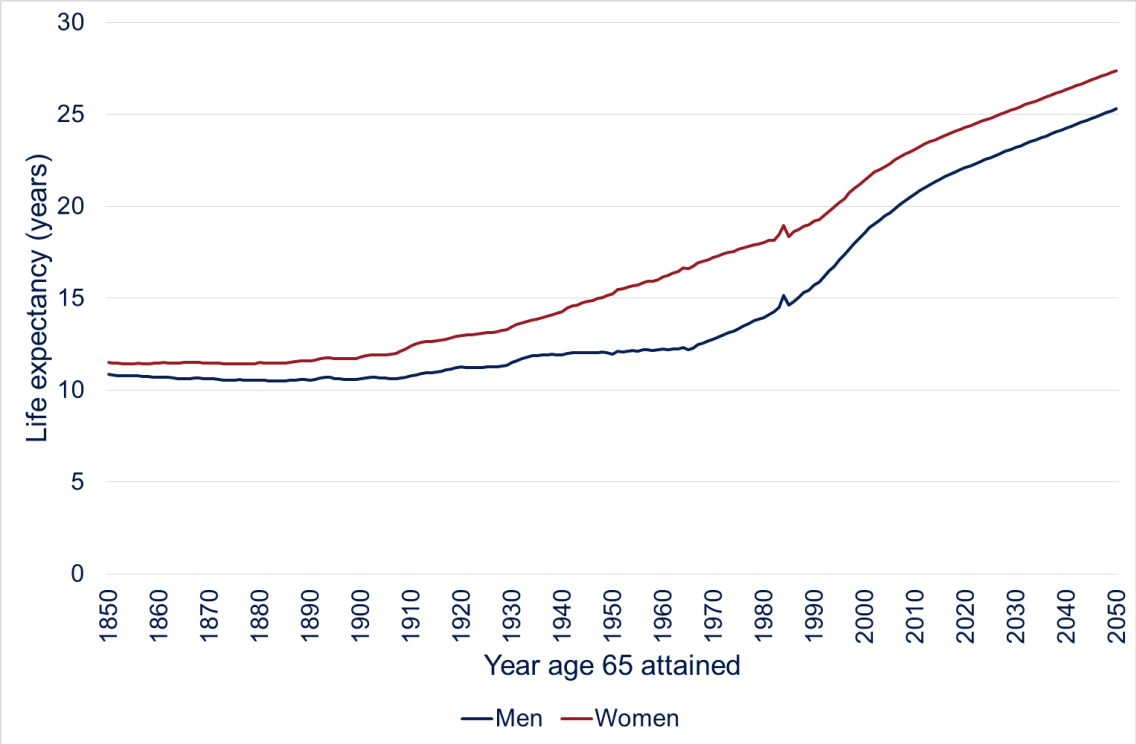
5.7 Additionally, I have been instructed that figures for life expectancy at SPa shown in this report should be calculated using assumed probabilities of death at each age and in each year, and should be based on life expectancies for the population as a whole taking men and women together, weighted for the different numbers of men and women in the population at the relevant age and year.

5.8 I have been invited to conduct appropriate sensitivity analysis to the specified life expectancy assumptions, including using the high and low life expectancy variant projections produced by the ONS alongside its principal projections. I have also been asked to consider the impact of upward or downward revision of life expectancy forecasts to reflect recent fluctuations in ONS life expectancy projections and its effect on calculated SPa timetables.

Trends in life expectancy

5.9 Life expectancy in the UK has been improving steadily for a long period as mortality rates have fallen. The most recent ONS population projections assume that this trend is expected to continue over both the short and longer term. This is illustrated by the following graph showing how cohort life expectancy at age 65 has changed over the period since 1850 and is projected to change over the period until 2050. This graph is for England and Wales only, as life expectancy figures are not available for the UK before 1951.

Figure 2: *Projected cohort life expectancy at age 65, 1850 to 2050*



Source: ONS. ONS have noted that the 'blip' in the trend line in 1984 relates to the birth cohorts of 1918 to 1920, where the births were not evenly distributed throughout the year.

ONS methodology

5.10 The following section provides an overview of the ONS methodology used to determine life expectancy forecasts and population projections.[6]

5.11 In determining the rates of ultimate long-term mortality improvement, a variety of information is considered, including the levels and patterns of historical changes in mortality rates in the UK, the views of an advisory panel of experts, the likelihood of past trends being followed in future and the assumptions being used elsewhere in the UK and other countries.

5.12 The ONS life expectancy forecasts are produced by considering a combination of three components:

- mortality rates experienced in the recent past;
- an extrapolation of recent mortality improvement trends into the near future;
- an assumption about future improvements in the long term.

5.13 Age-specific and sex-specific mortality rates and rates of improvement in mortality by age and gender for the first year of the projection are estimated from an analysis of the trends in recently experienced mortality. For this purpose, historical deaths data and population estimates for the United Kingdom are used for the period up to the year preceding the base year (deaths and population data for the base year are not available until after the mortality assumptions for the projections are finalised). This data is used to produce a series of smoothed mortality rates and historical changes in those rates by age, sex and year. The initial base mortality table for a set of projections is then derived by extrapolating these smoothed rates up to the base year.

5.14 The projected rates of mortality improvement are then derived by:

- setting assumed rates of mortality improvement for the 25th year of the projection period (referred to as the 'target year');
- making assumptions on the method and speed of convergence of the assumed improvement rates in the base year to those in the target year;
- making assumptions about how improvement rates will change beyond the target year (the 'long-term' assumption).

5.15 Having obtained a set of projected mortality improvement rates and assumed mortality rates for the base year of the projections, the projected improvement rates are then applied to the base year mortality rates to obtain projected mortality rates for the following year. The projected improvement rates for the next year are then applied to these rates to obtain projected mortality rates for that year, and so on.

[6] For more detail see https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections

5.16 Hence, the assumed rates of mortality improvement in the short term are driven mainly by the trends in mortality rates in recent years, whilst in the longer term they are driven mainly by the assumptions made regarding the long-term rates of improvement.

5.17 Recent mortality experience is therefore highly influential in the ultimate projections. Where this experience is somewhat different from what had been expected in the most recent previous projections – referred to be as being "off trend" – then this can lead to changes in mortality assumptions with consequences for policymakers using these projections. I illustrate this effect in the sensitivity analysis set out in section 7 of this report.

ONS 2014-based principal population projections

5.18 The assumptions used in the ONS 2014-based principal population projections[7] are that rates of improvement in mortality rates for most ages will converge to 1.2% pa in 2039 (the 25th year of the 2014-based projections) and remain constant at 1.2% pa thereafter. This rate of 1.2% pa is broadly the same as the average annual rate of improvement over the whole of the 20th century for both men and women (although these improvement rates varied by age), and was chosen with regard to advice from an expert academic advisory panel.

5.19 However, those born after 1922 and before 1939 have exhibited greater rates of improvement in mortality rates over the last 25 years than those born on either side. There is currently no evidence that these differentials are declining. Similar cohort effects seen in other countries suggest that these differentials may persist well into the oldest ages. As a result, it is assumed that these cohorts will continue to experience higher rates of mortality improvement than 1.2% pa in 2039 and beyond. Similarly, rates of improvement for those born before 1922 are somewhat lower than 1.2% pa in 2039 and beyond.

5.20 There is a wide range of views about the rate of future improvements in mortality rates. Recent data on practice amongst UK defined benefit pension schemes for actuarial funding valuations (produced by the Pensions Regulator[8]) showed that nearly 80% of such schemes assumed a long term mortality improvement rate of 1.5% pa or higher. However, mortality assumptions for actuarial funding valuations must be chosen on a prudent basis, whereas the ONS long-term rate is intended to represent a best-estimate basis.

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7 http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2015-10-29

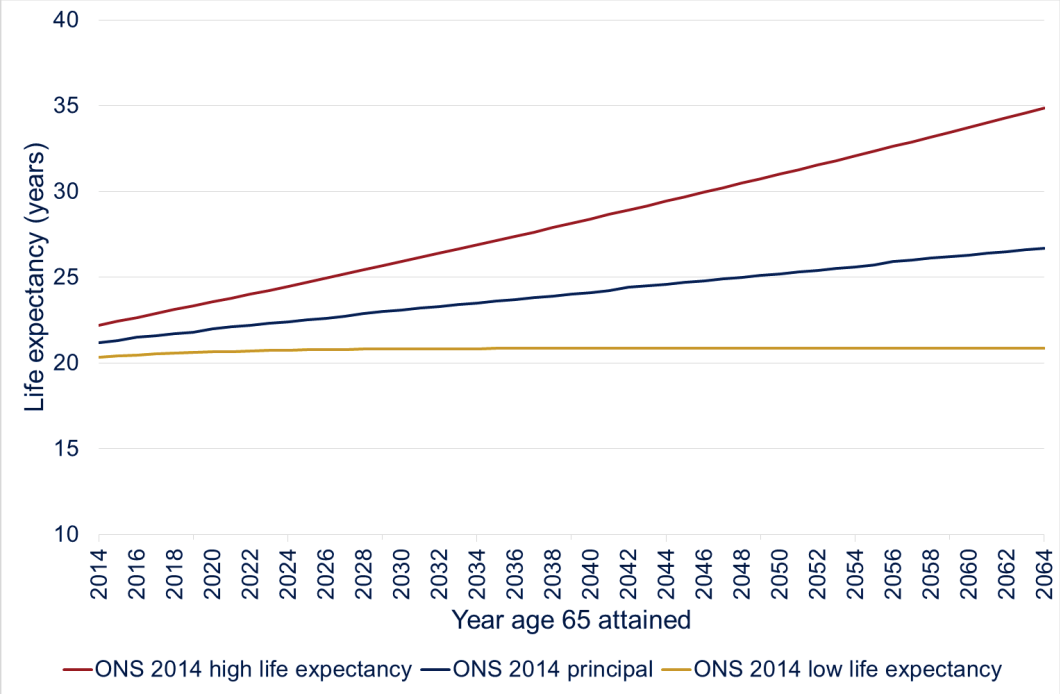
8 http://www.thepensionsregulator.gov.uk/docs/scheme-funding-2016.pdf

Variant projections

5.21 Population projections are uncertain and become increasingly so the further they are carried forward in time. In addition to the principal population projections, ONS produce variant projections based on alternative assumptions, which are intended to provide an indication of uncertainty and sensitivity to alternative assumptions. These variants include "high" and "low" projections of future life expectancies alongside the principal projections. For the 2014-based projections, the high variant allows for future long-term mortality improvements for most ages of 2.4% pa and the low variant allows for future long-term mortality improvements for most ages of 0% pa – compared to the long-term improvement rate for most ages of 1.2% pa in the principal projections – with the variant long-term improvement rates blended into the short-term rates in a consistent manner with the principal projections.

5.22 The graph below shows differences in UK cohort life expectancy for men at age 65 between the principal, high and low life expectancy projections, over the period from 2014 to 2064.

Figure 3: *Projected male cohort life expectancy at age 65 under ONS 2014-based principal, high and low life expectancy population projections, 2014 to 2064*



Source: ONS

5.23 The high and low variant projections produced by ONS may be considered relatively extreme when compared to the actual average annualised improvements in mortality rates over the last century or so – although they should not be regarded as upper and lower boundaries, given the uncertainty with regard to actual future longevity changes over the time period being considered here – and intermediate projections could also be derived.

5.24 In practice, if ONS were to change the long-term central improvement rate from the current level of 1.2% pa, it is likely that such a change would be less than under the high and low variants over a relatively short time period such as that for successive SPa reviews. For example, a long-term rate of 1.2% pa has been used since the 2010-based projections – for the ONS population projections from 2004 to 2008 a long-term rate of 1.0% pa was used, with slightly different methodologies in force prior to that.

5.25 When considering the implications of possible changes to the long-term improvement rate by the ONS, it may therefore be helpful to consider smaller changes than those under the high and low life expectancy variants. I discuss this issue further in the sensitivity analysis set out in section 7 of this report.

Other mortality projections

5.26 In addition to the projections produced by the ONS, there are a number of other sources of life expectancy information. It is helpful to consider these other sources for comparison with the ONS data and methodologies.

5.27 The Continuous Mortality Investigation (CMI)[9], supported by the Institute and Faculty of Actuaries, provides mortality rate tables for UK life insurers and pension funds. The CMI publishes graduated tables of age-related mortality rates for members of UK self-administered pension schemes using experience data collected from those schemes.

5.28 The CMI has also produced a mortality projection model, first published in 2009, which is currently the most widely used model for mortality improvements in the actuarial profession. This model produces projected mortality improvement rates for future years which can then be applied to the assumed graduated table of age-related mortality rates to derive projected mortality rates. It operates in a similar way to the ONS projections, in that there are three components to the model – the initial rates of improvement based on recent experience, the assumed long-term rates of improvement, and the path of convergence between these two rates. However, the CMI model is driven by user inputs, which can be set to reflect specific views on the current level and likely path of future longevity improvements.

5.29 The projections in the CMI model are based on ONS population data, albeit for England and Wales only rather than for the whole UK, and so exhibit similar features as those described above, such as the "off trend" experience in recent years and the cohort effects (see paragraphs 5.17 and 5.19 above). There are some differences between the CMI and the ONS methodology – for example regarding the approach to setting long-term improvement rates and the convergence between the assumed short-term and long-term assumptions – but the general approach to setting future mortality projections is very similar.

5.30 Another mortality model is produced by the Pensions and Lifetime Savings Association (PLSA) (previously known as the National Association of Pension Funds

[9] https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation

(NAPF)) – the NAPF Longevity Model (powered by Club Vita, which is a company providing longevity services to UK occupational pension schemes). This model is based on data from a large sample of pensioners in UK defined benefit pension schemes, and includes analysis based on rating factors such as geographical location, affluence and occupation. This model uses various calibrations of the CMI mortality projection model to derive long-term projections of mortality improvements.

5.31 Because the CMI and PLSA mortality tables are based on data from sub-sets of the population – members of certain types of defined benefit pension schemes – they are less appropriate for determining mortality assumptions for setting the future path of SPa. The mortality experience of members of occupational pension schemes is likely to be somewhat different to the mortality experience of the UK population as a whole – for example, because active members of occupational pension schemes are generally in paid employment, which requires a certain level of health, and hence implies higher long-term longevity rates than the general population. However it is helpful for context to note the similarity in long-term projection methodologies between these models and the projections produced by the ONS.

Life expectancies for different population sub-groups

5.32 I have been instructed to consider only measures of mortality for the UK population as a whole and to use these to establish the timetable of future SPa increases according to the principles and methodology laid out in the Terms of Reference for this report.

5.33 In my view, it is important to bear in mind that these instructions and principles apply only to the average experience and average expectation of individuals. As highlighted in the interim report of John Cridland's independent review of SPa and elsewhere, in practice there are considerable variations in experience from one individual to another across the population, and the use of average life expectancies masks the variations that exist between different individuals within the population.

5.34 Although I have been instructed that life expectancies should be taken for men and women together (weighted for the different numbers of men and women in the population at the relevant age and year), gender is a key factor – women live somewhat longer than men on average, although the gap has been reducing over recent periods.

5.35 Studies have also shown that life expectancies can be different when considering factors such as socio-economic class, geographical location, occupation, and health factors and behaviours (for example smoker status). However, such differences in life expectancies are not uniform within these groups, as between individuals and within any sub-grouping with a common risk factor, there is still considerable heterogeneity in life expectancy. For example, whilst the experience of certain lives in a geographical location may, in statistical terms, be significantly different from the general population, geography is not the driver of that experience, rather it is more likely to be socio-economic. Moreover, there is still considerable variation within geographical groups.

5.36 The statistical justification for choosing one basis of sub-grouping over another for SPa, according to a common risk factor, could seem quite arbitrary.

Healthy life expectancies

5.37 Although life expectancies in general in the UK have been steadily increasing over time, consideration could also be given to the quality of life experienced by those living longer, for example by considering a measure of life expectancy in good health.

5.38 The ONS produces measures of healthy life expectancies, which are calculated by asking survey respondents to self-rate their health, and then combining the results with age-specific mortality rates to estimate the average number of years spent in good health.

5.39 Recent data produced by ONS[10] shows that whilst life expectancy for the UK population as a whole has continued to increase in recent years, the proportion of life spent in good health appears to have varied in different ways depending upon how the data is analysed. For example, comparing the observed data from 2009 to 2011 with that from 2013 to 2015, whilst the proportion of total life spent in good health has actually slightly reduced, the proportion of life from age 65 onwards spent in good health has increased. This highlights some of the difficulties of interpreting and using the data available for healthy life expectancies.

5.40 There are a number of other such difficulties:

- healthy life expectancy figures are generally only available on a "period" basis – that is, without any allowance for either future mortality improvements or future changes in health status or disability rates by age – whereas the rest of the figures considered in this report are on a "cohort" basis (see paragraphs 5.3 to 5.5 above);
- there is much subjectivity in the way that people are classified as "healthy" or not, which can lead to different individuals with the same conditions being classified differently at different times, depending on their own views of the extent of their unhealthiness;
- data on healthy life expectancies based on agreed and consistent methodologies have not been around long enough to establish reliable series which could be used as a basis for setting SPa.

5.41 In my opinion it would be difficult to frame a policy for setting the SPa in terms of healthy life expectancies at the current time, and this is unlikely to change until the issues outlined above have been addressed and until considerably more long-term trend data is available than at present.

[10] https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/healthstatelifeexpectanciesuk/2013to2015

6 Results on specified parameters and assumptions

6.1 This section of the report sets out a summary of the results of the calculations under each of the two scenarios for the specified proportion of adult life in retirement, based on the assumptions and parameters set out in sections 4 and 5. More detailed results are set out in Appendix B to this report.

6.2 The key assumptions and parameters used here are:

- mortality assumptions – ONS 2014-based UK principal population projections
- age adult life assumed to begin – 20
- specified proportion of adult life in retirement – (i) 33.3%, (ii) 32.0%.

6.3 Under these assumptions, and following the specified formula, then where the specified proportion of adult life in retirement is 33.3%:

- SPa should increase from 67 to 68 over the two-year period from 6 April 2039 to 5 April 2041
- SPa should increase from 68 to 69 over the two-year period from 6 April 2053 to 5 April 2055
- There should be no further increases to SPa over the period to 5 April 2064.

6.4 Similarly, where the specified proportion of adult life in retirement is 32.0%:

- SPa should increase from 67 to 68 over the two-year period from 6 April 2028 to 5 April 2030
- SPa should increase from 68 to 69 over the two-year period from 6 April 2040 to 5 April 2042
- SPa should increase from 69 to 70 over the two-year period from 6 April 2054 to 5 April 2056
- There should be no further increases to SPa over the period to 5 April 2064.

6.5 The table below illustrates how the calculated SPa timetables outlined above will impact upon individuals, based on their dates of birth.

Table 3: *Calculated SPa timetables under specified parameters and assumptions, 2028 to 2064 – dates of birth for affected individuals*[11]

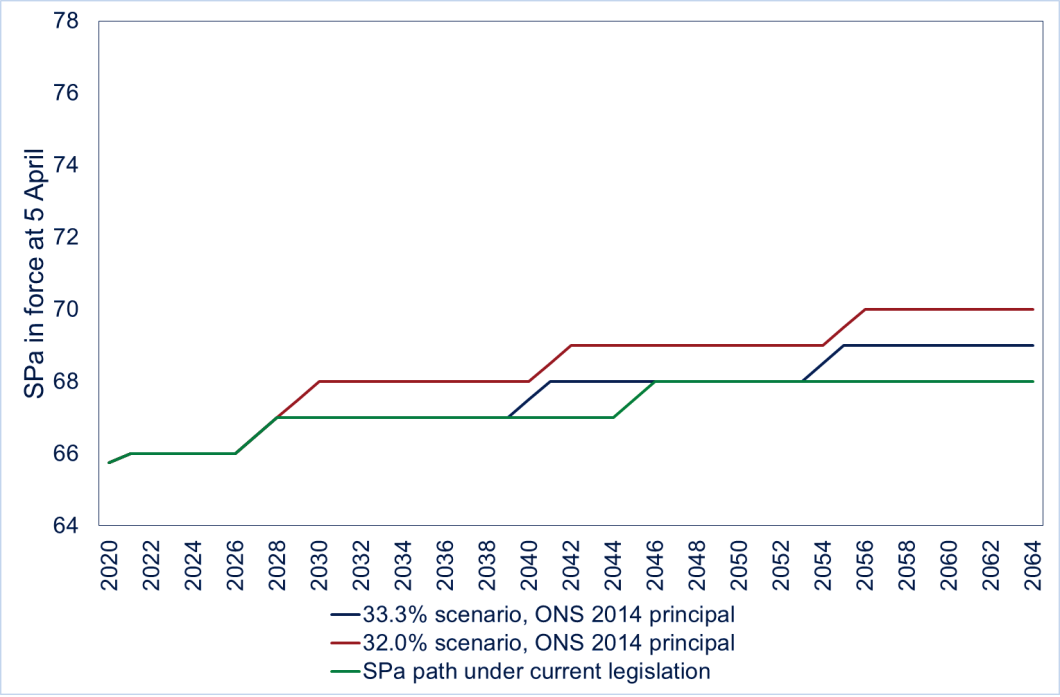
Date of birth		SPa under current legislation	SPa under 33.3% scenario	SPa under 32.0% scenario
From	To			
6 April 1961	5 April 1962	67	67	67 to 68*
6 April 1962	5 April 1972	67	67	68
6 April 1972	5 April 1973	67	67 to 68*	68 to 69*
6 April 1973	5 April 1977	67	68	69
6 April 1977	5 April 1978	67 to 68*	68	69
6 April 1978	5 April 1985	68	68	69
6 April 1985	5 April 1986	68	68 to 69*	69 to 70*
6 April 1986	onwards**	68	69	70

* Transitional period - SPa for people born in this period will be somewhere in the range indicated

** This report only considers SPa changes between 6 April 2028 and 5 April 2064

6.6 These results are summarised in the graph below:

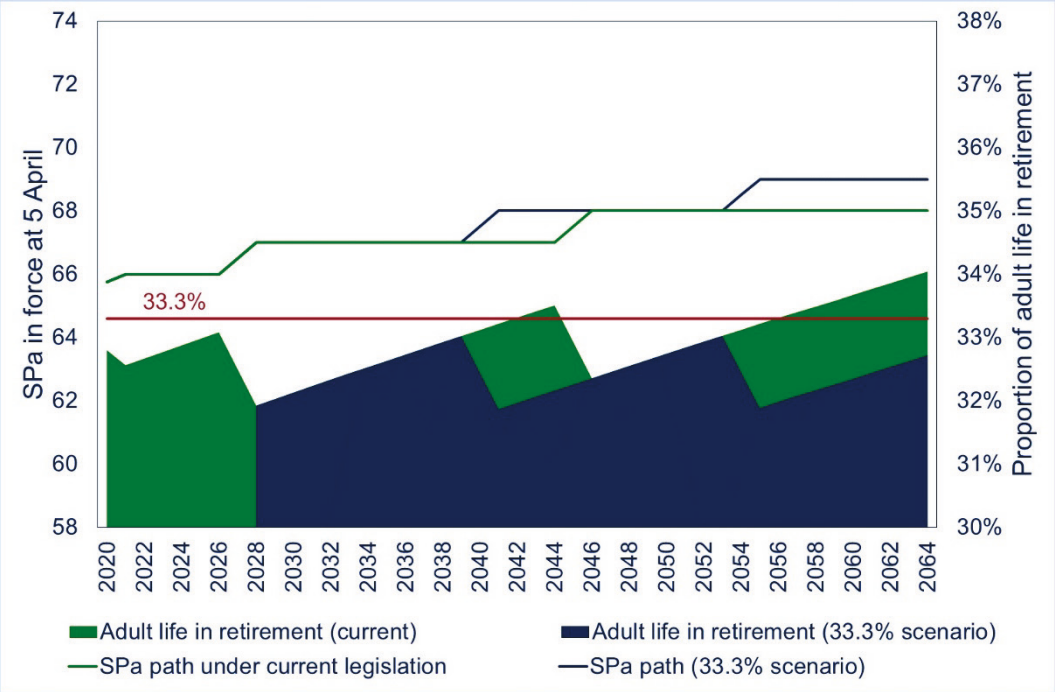
Figure 4: *Calculated SPa timetables under specified parameters and assumptions, 2020 to 2064*



[11] This is the same as Table 2 which appears in section 1 of this report.

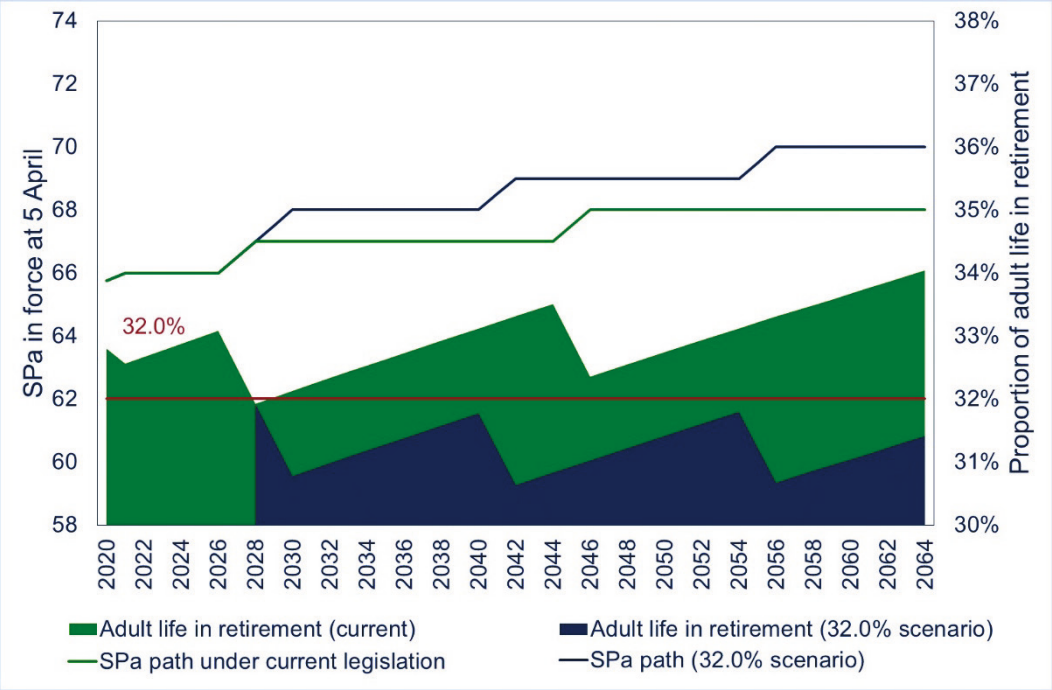
6.7 As explained in section 4 of this report, the methodology adopted for these calculations allows for SPa to complete each increase to the next SPa in the year in which the proportion of adult life in retirement would have first reached the specified proportion, had SPa not been changed. The graph below illustrates how these calculations work in practice for the 33.3% scenario, showing how SPa is changed just in time so that the proportion of adult life in retirement never exceeds the relevant specified proportion, with the transition to the new SPa starting two years before the specified proportion would have been expected to be exceeded.

Figure 5: *Calculated proportion of adult life in retirement, and calculated SPa timetables, under specified parameters and assumptions, 2020 to 2064 (33.3% scenario)*



6.8 The corresponding graph below illustrates how these calculations work in practice for the 32.0% scenario.

Figure 6: *Calculated proportion of adult life in retirement, and calculated SPa timetables, under specified parameters and assumptions, 2020 to 2064 (32.0% scenario)*



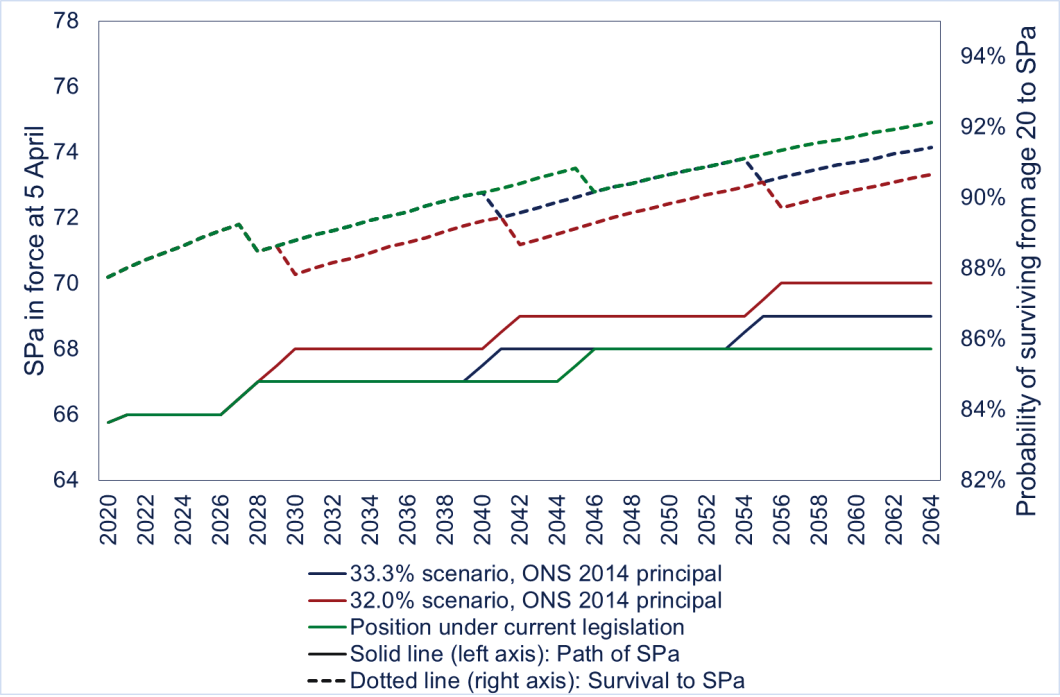
6.9 The proportion of adult life in retirement already exceeds 32.0% in 2020 (in fact, it exceeds 32.0% at the current time in 2017). However under this scenario the increase to SPa from 67 to 68 would only commence in 2028 because this report only considers changes to the SPa timetable after this date. This means the increase to SPa from 67 to 68 would take place in the two-year period immediately following the completion of the increase from 66 to 67 (so SPa would increase from 66 to 68 over a 4-year period from 2026 to 2030).

Likelihood of reaching SPa

6.10 Under each scenario, the specified proportion of adult life in retirement is the rate that would apply for those reaching SPa across the whole UK population. Individuals reaching SPa will in practice experience a proportion of their adult life in retirement which will depend upon their own characteristics and circumstances.

6.11 Further, some people will die before reaching SPa. The graph below illustrates the likelihood of an individual having reached SPa in a given year and how this varies by the different SPa paths under current legislation and each of the two scenarios outlined above. This graph illustrates the probability of an individual retiring in a given year having survived from the assumed start of adult life (age 20) to the relevant SPa.[12]

Figure 7: *Probability of surviving from age 20 to SPa, and calculated SPa timetables, under specified parameters and assumptions, 2020 to 2064*



6.12 This shows that the probability of individuals surviving from age 20 to SPa is gradually expected to increase over time, from a level of around 88% in 2020 to somewhere above 90% by the end of the projection period in 2064.

6.13 Each increase in SPa results in a temporary reduction in the survival rates, but the long-term trend is still upwards, under both the current legislation for SPa timetable changes and under either of the central scenarios considered in this report – despite the projected increases in SPa occurring during this period. This reflects continuing improvements in longevity rates expected over this period, based on the ONS principal population projections.

[12] For example, the figure of 88% in 2020 shows that the probability of a person who was aged 20 in 1974 surviving from then to retire at SPa of 66 in 2020 was around 88%, calculated on a unisex basis.

7 Sensitivity analysis

7.1 As part of my report, I have been asked to conduct appropriate sensitivity analysis to the results of the calculations, including (but not limited to):

- analysis based on high and low life expectancy variant projections;
- analysis of the likely upward and downward revisions of life expectancy forecasts to reflect recent fluctuations in ONS life expectancy projections, and its effect on calculated SPa timetables;
- any other factors which may be material.

7.2 This section therefore sets out the results of the calculations under each of the two scenarios for the specified proportion of adult life in retirement based on a number of alternative assumptions as set out below. For the results in this section, the key assumptions and parameters used are all the same as those set out in section 6 unless indicated otherwise.

7.3 Future mortality rates are particularly uncertain, and the results – in terms of the effect on calculated SPa timetables – are highly sensitive to both the assumptions and experience in the calculation of future life expectancies. It is important to consider the impact of changes to both the short-term and long-term mortality assumptions. Short-term assumptions are affected by recent mortality experience – as noted in section 5, this has been "off trend" from what was expected in recent years – and can be quite variable from one set of ONS projections to the next. Long-term assumptions are more subjective, and the long-term improvement rates that are used by ONS in their principal projections may change over time.

Summary of results

7.4 The key finding from my sensitivity analysis is that what can appear to be relatively small changes in either the short-term or long-term mortality assumptions can have a significant effect on the calculated SPa timetables. In particular, analysis using successive sets of ONS principal population projections can result in very different calculated SPa timetables being derived. It is highly likely, therefore, that using the next set of ONS population projections (expected to be published in late 2017) would result in somewhat different calculated SPa timetables being derived, all other things being equal.

7.5 Each time the more recent data from ONS is used, not only do the base year mortality rates change, but so also do the future improvement rates for subsequent years. This magnifies the effect of any changes when applied to the specified formula, and relatively minor changes to the assumptions can result in fairly large changes to the calculated SPa timetable.

7.6 A summary of the calculations from my sensitivity analysis is set out below:

- if the ONS 2010- or 2012-based principal population projections were used instead of the 2014-based projections, the calculated timetable for SPa increases over the projection period could move by up to 8 years;
- if the long-term mortality improvement rate assumed by ONS, which is currently 1.2% pa at most ages, was changed by 0.2% pa in either direction, the calculated timetable for SPa increases over the projection period could move by up to 10 years;
- combinations of the two effects above – that is, differences in successive sets of ONS principal population projections along with a change in the long-term mortality improvement rate – could therefore have an even greater effect on the calculated SPa timetables.

7.7 I set out below more detailed information about the sensitivity calculations I have carried out.

Short-term mortality assumptions

7.8 The ONS publishes new sets of population projections every two years. The most recent (2014-based) projections, which have been used for the calculations set out in section 6, were published in October 2015, and the next (2016-based) projections are expected to be published by late 2017.

7.9 The mortality rates assumed for the base year of each set of ONS projections, and the projected rates of improvement over the short-term after the base year, are based upon trends in population experience up to the preceding year. Each new set of ONS projections allows for two more years of experience, and contains the most recent available data on which to base projections.

7.10 Nevertheless, and despite the smoothing methodologies adopted by ONS, successive sets of ONS projections can produce significant variations in the calculated timetable of SPa increases under the prescribed methodology set out in section 5. This is because the use of more recent data by ONS impacts on not only the base year mortality rates, but also on the future improvement rates for each subsequent year over the short to medium term (until the assumed long-term improvement rate is reached after 25 years) – magnifying the effect of any changes when applied to the specified formula.

7.11 To illustrate the sensitivity of the results to changes in the ONS life expectancy projections, I have considered how the results outlined in section 6 would be different if the 2012-based or 2010-based principal projections had been used instead of the 2014-based principal projections. This gives an indication of how the life expectancy forecasts produced by ONS can fluctuate from one set of projections to the next in practice, and the resultant effect on the calculated SPa timetables.

7.12 In each of these sets of ONS projections, the assumed long-term rates of mortality improvement were the same – based on an ultimate rate of improvement of 1.2% pa at most ages – albeit coming into force at slightly different dates (25 years after the base year in each case). However, the base tables and short-term improvement

rates show more variability between the different sets of projections, reflecting fluctuations in recent mortality experience.

7.13 The table below shows differences in cohort life expectancies at age 65 for men and women, on the ONS 2014-, 2012- and 2010-based principal population projections, calculated in both 2014 (the start date of the most recent population projections) and 2064 (the end of the projection period covered by this report).

Table 4: *Cohort life expectancies at age 65 (in 2014 and 2064) under ONS 2014-, 2012- and 2010-based principal population projections*

ONS principal population projections	Cohort life expectancy at age 65			
	Men		Women	
	2014	2064	2014	2064
2014-based	21.2	26.7	23.5	28.7
2012-based	21.5	27.2	24.2	29.7
2010-based	21.6	27.5	24.2	29.8

7.14 Although the differences in life expectancies may appear to be relatively small between the different sets of projections, such variations have a significant impact on the calculated proportion of adult life in retirement under the prescribed formula, as noted in paragraph 7.4 above.

7.15 Specifically, in the tax year 2028-29 (the first year of the projections covered by this report), the calculated proportion of adult life in retirement under the ONS 2014-based principal projections (based on the currently legislated SPa timetable) is 32.0%. However, this would be 32.5% under the 2012-based principal projections and 32.6% under the 2010-based principal projections.

7.16 This has a resultant knock-on effect to the calculated SPa timetables, as shown in the table below.

Table 5: *Calculated SPa timetables under ONS 2014-, 2012- and 2010-based principal population projections, 2028 to 2064*

SPa changes	ONS 2014-based principal projections*		ONS 2012-based principal projections		ONS 2010-based principal projections	
	33.3%	32.0%	33.3%	32.0%	33.3%	32.0%
67 to 68	2039-41	2028-30	2034-36	2028-30	2033-35	2028-30
68 to 69	2053-55	2040-42	2047-49	2034-36	2046-48	2033-35
69 to 70	n/a	2054-56	2061-63	2047-49	2059-61	2046-48
70 to 71	n/a	n/a	n/a	2061-63	n/a	2059-61

* as set out in section 6

7.17 The graphs below illustrate the figures in the table above for the 33.3% and 32.0% scenarios respectively:

Figure 8: *Calculated SPa timetables under ONS 2014-, 2012- and 2010-based principal population projections, 2020 to 2064 (33.3% scenario)*

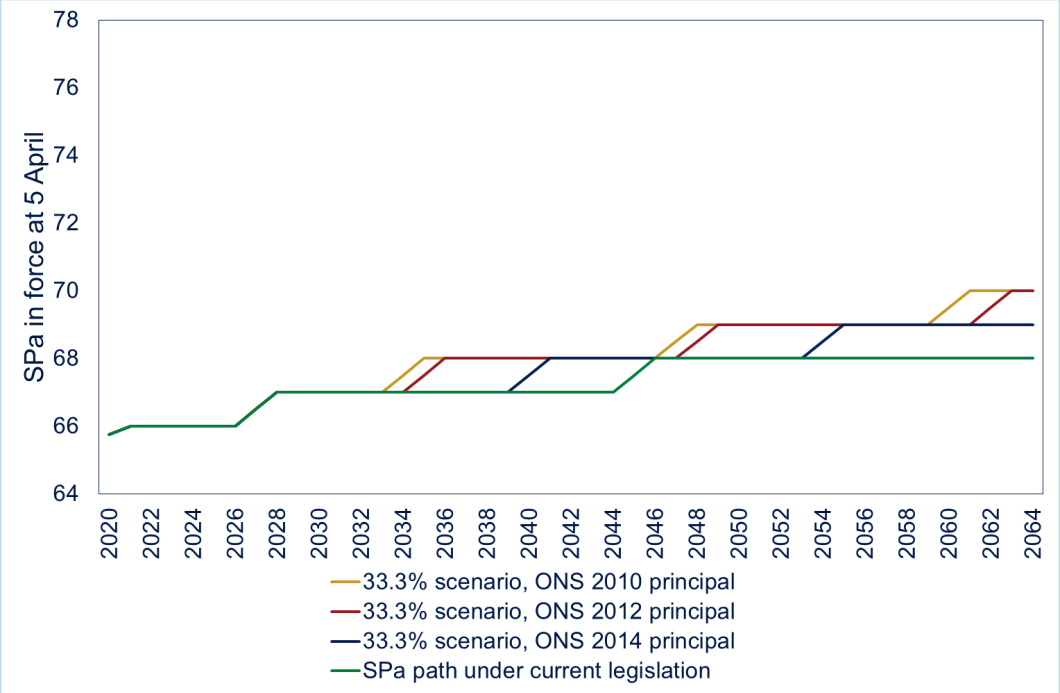
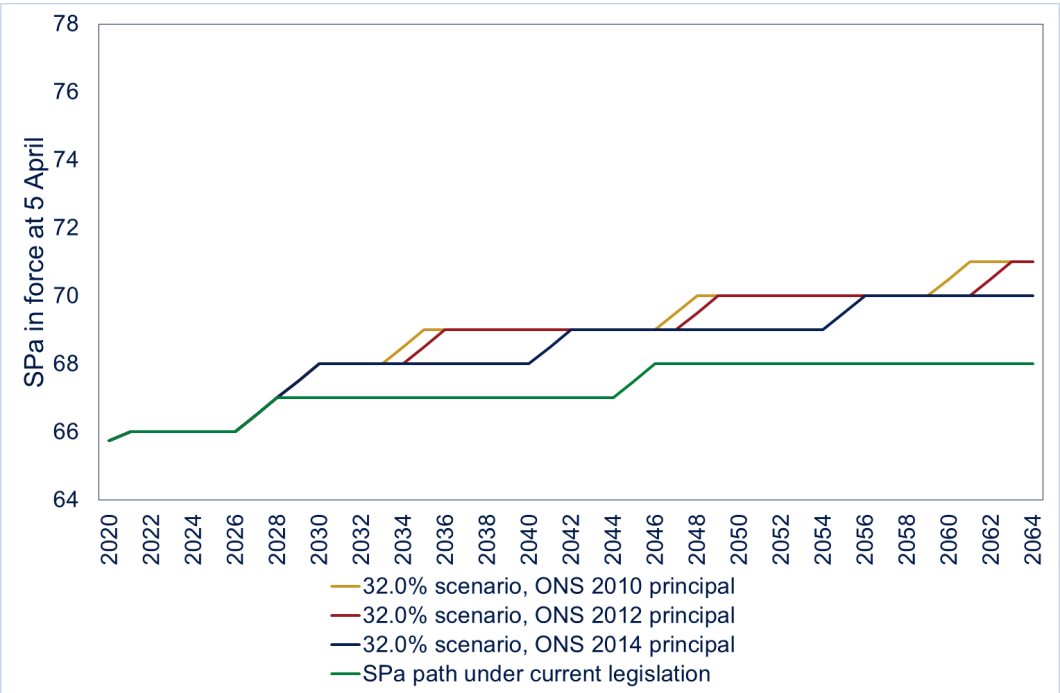


Figure 9: *Calculated SPa timetables under ONS 2014-, 2012- and 2010-based principal population projections, 2020 to 2064 (32.0% scenario)*



7.18 The table and graphs above show how the calculations to establish the future path of SPa changes can vary between different sets of ONS principal population projections, and that differences in successive projections can be in either direction. This illustrates how the results are very sensitive to changes in mortality assumptions, even though such changes are driven by relatively short periods of actual mortality experience in 2-year assessment periods.

7.19 In particular, under the 33.3% scenario, the calculated timetable for increasing SPa from 67 to 68 would have been 5 years earlier under the 2012-based projections (compared to the 2014-based projections), and a further year earlier under the 2010-based projections, with similar differences in the calculated timetable for increasing SPa to higher levels. Under the 32.0% scenario, there are no differences in the calculated timetable for increasing SPa from 67 to 68 (which would take place at the earliest possible time under this report, between 2028 and 2030 under all three sets of ONS projections), but there are large differences between the calculated timetables for increasing SPa above 68, particularly between the 2012-based and 2014-based projections.

7.20 The difference between the ONS 2012-based and 2014-based population projections was primarily because there was relatively little improvement in observed mortality rates experienced during 2012 and 2013. This was a slower improvement than had been expected in the 2012-based projections, which resulted in the adoption of lower assumed improvement rates and higher mortality rates in the 2014-based population projections than were adopted in the 2012-based projections, particularly at older ages. As there was no change in the assumed long-term rate of improvement, of 1.2% pa at most ages, this resulted in higher projected rates of mortality in future years as well.

7.21 It is impossible to predict how future ONS population projections might vary, being based on future unknown experience. The scenarios highlighted above do not represent upper or lower bounds of future variability, and somewhat different levels of future changes would be possible. However, noting the variations in the 2010-based, 2012-based and 2014-based projections, it is highly likely that if the calculations set out in this report were to be redone based on the next set of ONS population projections – which are expected to be published by late 2017 – this would result in somewhat different calculated SPa timetables under either scenario outlined in this report, all other things being equal.

7.22 Under the prescribed methodology of using the most recent ONS principal population projections, this could lead to large variations in the calculated SPa timetables when the next SPa review is carried out – due to be within 6 years of this review, that is by 2023 – as up to three further sets of ONS population projections are likely to have been published by then. This highlights the potential risks of the calculated SPa timetables in line with the prescribed formula being subject to considerable variation at subsequent reviews when using more up-to-date ONS population projections.

Long-term mortality improvements

7.23 As explained in section 5 of this report, the ONS mortality projections are derived by considering a combination of mortality rates experienced in the past and assumptions about future improvements. The long-term improvement rates are much more subjective and changes to these rates could also result in significant changes to the calculated SPa timetables.

High and low variant projections

7.24 As noted in section 5, the ONS has published "high" and "low" variant projections of future life expectancies, alongside the 2014 principal projections, which allow for future long-term mortality improvements for most ages of 2.4% pa and 0% pa respectively, compared to the rate of 1.2% pa in the principal projections. These variant projections illustrate how relatively large changes in the long-term mortality improvement rates can have a major impact on the calculated proportion of adult life in retirement and the resultant calculated SPa timetables.

7.25 Using these variant projections results in the projected increases in SPa required over the period from 2028 to 2064 changing as set out in the table below.

Table 6: *Calculated SPa timetables under ONS 2014-based principal, high and low life expectancy population projections, 2028 to 2064*

SPa changes	ONS 2014-based principal projections*		ONS 2014-based High life expectancy variant projection		ONS 2014-based Low life expectancy variant projection	
	33.3%	32.0%	33.3%	32.0%	33.3%	32.0%
67 to 68	2039-41	2028-30	2028-30	2028-30	n/a	n/a
68 to 69	2053-55	2040-42	2030-32	2030-32	n/a	n/a
69 to 70	n/a	2054-56	2035-37	2032-34	n/a	n/a
70 to 71	n/a	n/a	2041-43	2035-37	n/a	n/a
71 to 72	n/a	n/a	2048-50	2042-44	n/a	n/a
72 to 73	n/a	n/a	2054-56	2048-50	n/a	n/a
73 to 74	n/a	n/a	2061-63	2054-56	n/a	n/a
74 to 75	n/a	n/a	n/a	2061-63	n/a	n/a

* as set out in section 6

7.26 This shows that under the high life expectancy variant, several increases to the calculated SPa are required over the period from 2028 to 2064 using the prescribed formula under either the 33.3% or 32.0% scenario.

7.27 However, under the low life expectancy variant, no increases to the calculated SPa are required at all over this period under the prescribed formula under either scenario. In fact, under the prescribed formula, the calculated SPa would reduce after April 2028 under this variant, to 65 under the 33.3% scenario and to 66 under the 32.0% scenario, remaining at these levels throughout the period to 2064 without the proportion of adult life in retirement ever exceeding the respective specified proportions.

7.28 The graphs below illustrate the figures in the table above for the 33.3% and 32.0% scenarios. The dashed yellow line in these graphs represents the calculated SPa timetable under the low life expectancy variant if SPa were to reduce after 2028, with the solid yellow line representing the position under the low life expectancy variant if SPa does not reduce below the level currently legislated for.

Figure 10: *Calculated SPa timetables under ONS 2014-based principal, high and low life expectancy population projections, 2020 to 2064 (33.3% scenario)*

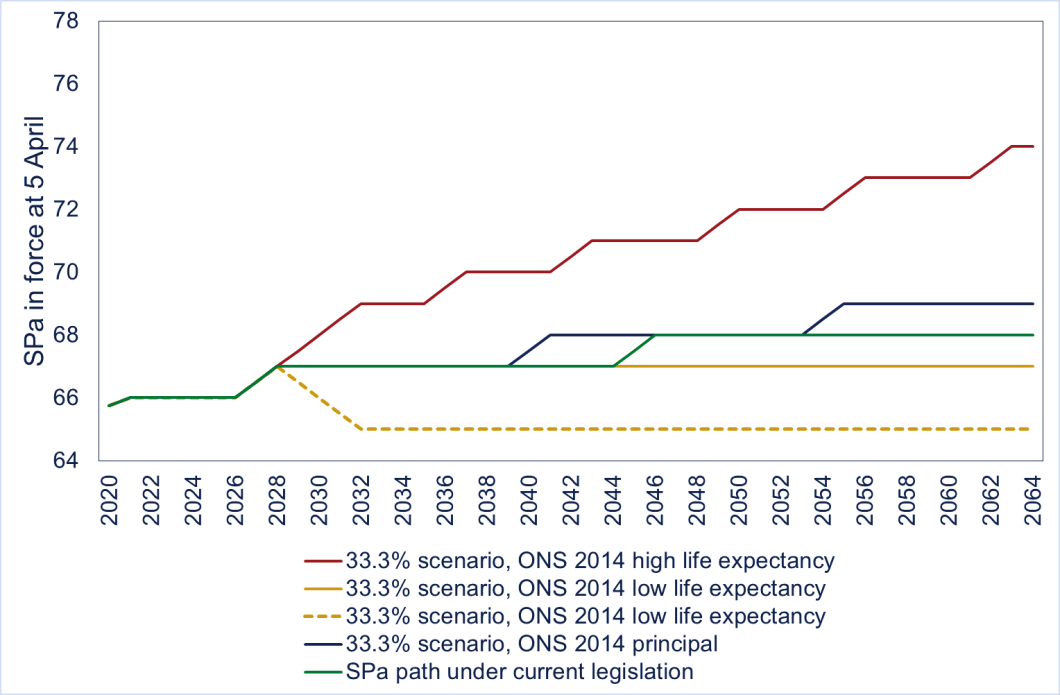
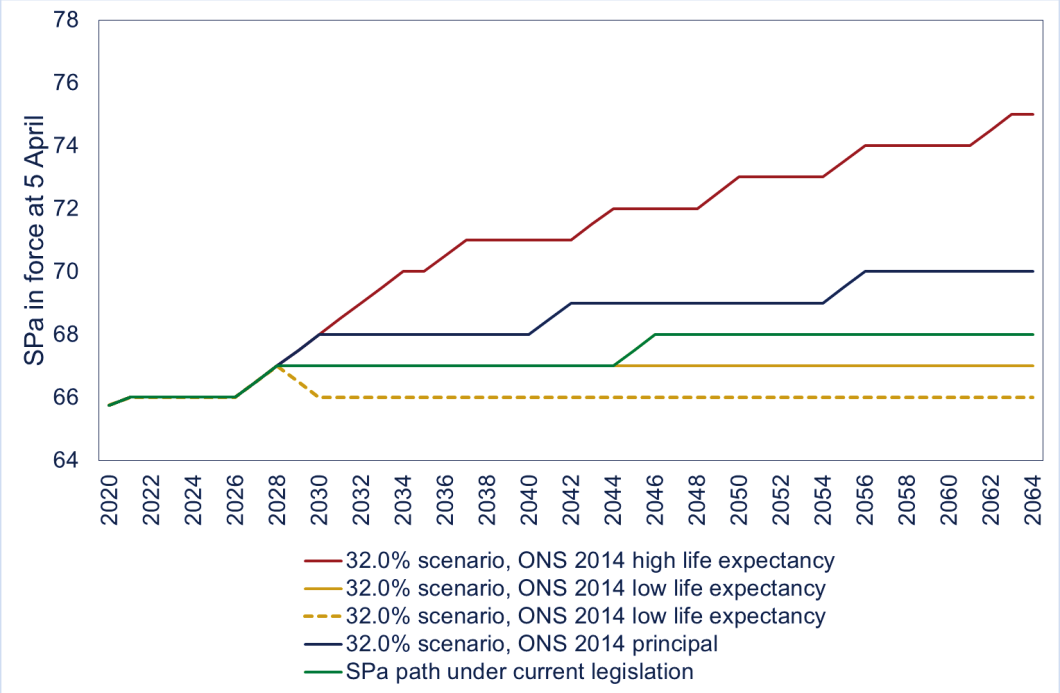


Figure 11: *Calculated SPa timetables under ONS 2014-based principal, high and low life expectancy population projections, 2020 to 2064 (32.0% scenario)*



Changes to principal projection rate

7.29 As discussed in section 5, in practice it is most unlikely that ONS would shift from the current principal long-term improvement rate of 1.2% pa to something as different as the high or low variant projections over a relatively short time period such as that for successive SPa reviews; the most recent change in the central long-term improvement rate was from 1.0% pa used in the 2008-based projections to 1.2% pa in the 2010-based and subsequent projections.

7.30 I therefore consider it helpful to consider smaller changes than those under the high and low life expectancy variants. For illustration, I set out below how the calculated SPa timetables might change if the long-term improvement rates under the 2014-based projections were changed by 0.2% pa in either direction – that is to 1.4% pa or 1.0% pa, rather than the principal assumption of 1.2% pa.

Table 7: *Calculated SPa timetables under ONS 2014-based principal population projections and adjusted long-term improvement rates, 2020 to 2064*

SPa changes	ONS 2014-based principal projection (1.2% pa)*		ONS 2014-based variant projection (1.4% pa)**		ONS 2014-based variant projection (1.0% pa)**	
	33.3%	32.0%	33.3%	32.0%	33.3%+	32.0%
67 to 68	2039-41	2028-30	2035-37	2028-30	2049-51	2031-33
68 to 69	2053-55	2040-42	2047-49	2035-37	n/a	2049-51
69 to 70	n/a	2054-56	2060-62	2048-50	n/a	n/a
70 to 71	n/a	n/a	n/a	2060-62	n/a	n/a

* as set out in section 6

** ONS have not produced variant projections with these long-term improvement rates, so these calculations have been carried out by GAD on an approximate basis

+ under this scenario, the calculated SPa should reduce from 2028 to 2030 from 67 to 66, before increasing again from 66 to 67 between 2030 and 2032

7.31 The graphs below illustrate the figures in the table above for the 33.3% and 32.0% scenarios.

Figure 12: *Calculated SPa timetables under ONS 2014-based principal population projections and adjusted long-term improvement rates, 2020 to 2064 (33.3% scenario)*

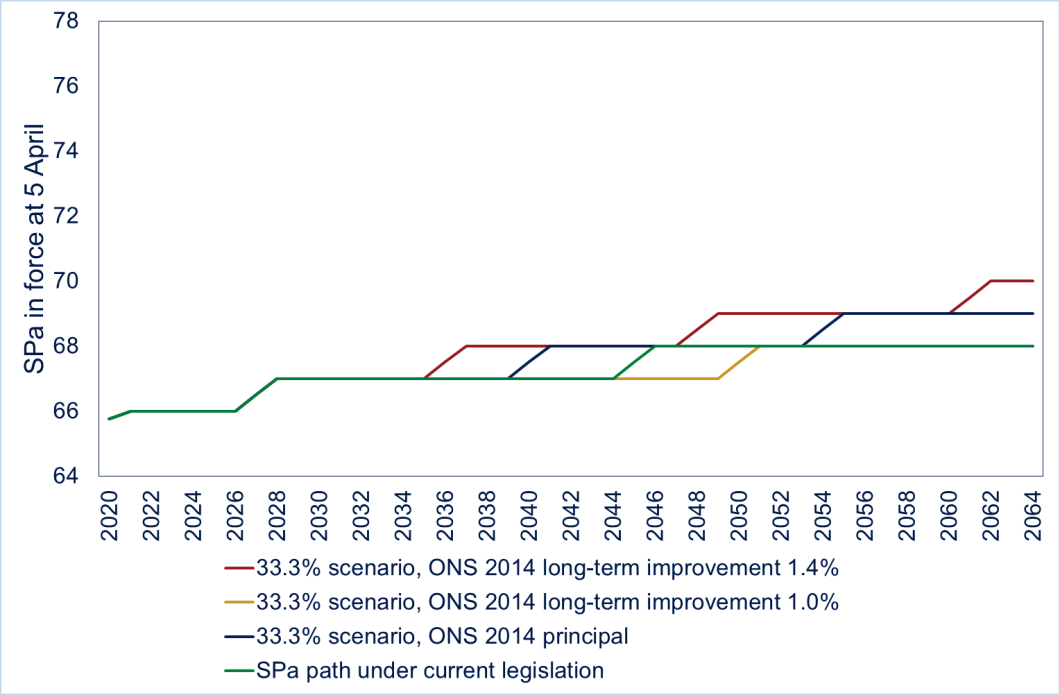
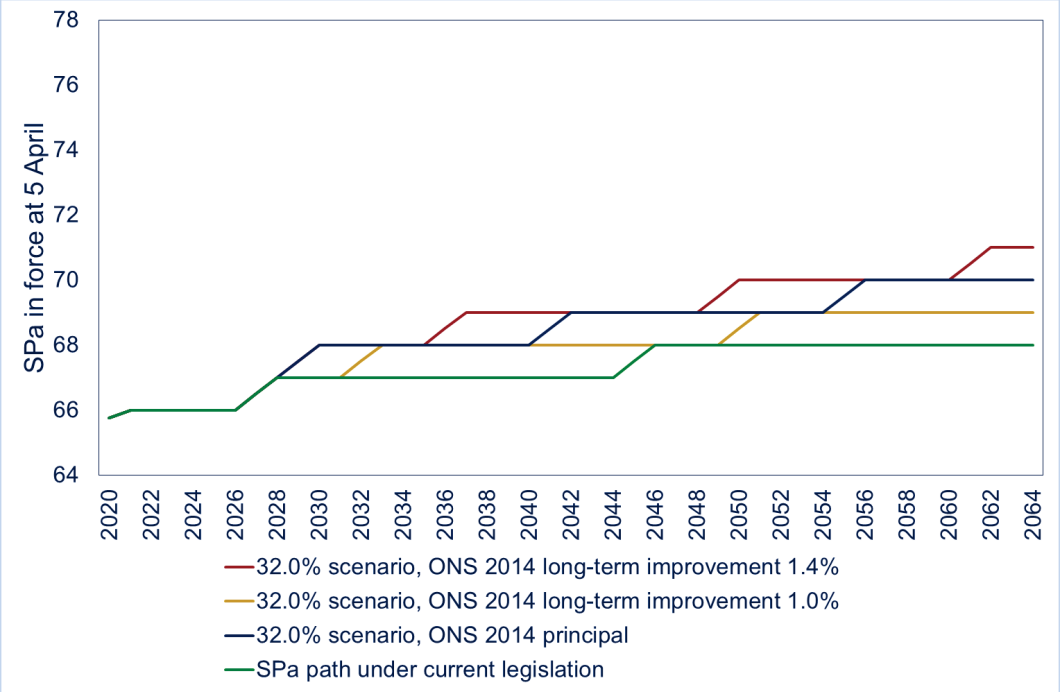


Figure 13: *Calculated SPa timetables under ONS 2014-based principal population projections and adjusted long-term improvement rates, 2020 to 2064 (32.0% scenario)*



7.32 For example, under the 33.3% scenario, if the long-term improvement rate was reduced from 1.2% pa to 1.0% pa, the calculated increase in SPa from 67 to 68 would be delayed by 10 years, whereas if the long-term improvement rate was increased from 1.2% pa to 1.4% pa, the calculated increase in SPa from 67 to 68 would be brought forward by 4 years. Similar effects are shown on future calculated SPa changes under the 32.0% scenario, although there is less impact on the increase from 67 to 68 (as this increases at the earliest possible time under the principal projections).

Comparison of long-term projection rates

7.33 The table below shows the differences in cohort life expectancies at age 65, for the different long-term improvement rates considered above, calculated in both 2014 (the start date of the most recent population projections) and 2064 (the end of the projection period covered by this report), along with the calculated proportions of adult life in retirement in the tax year 2028-29 (the first year of the projection period covered by this report).

Table 8: *Cohort life expectancies at age 65 (in 2014 and 2064) and calculated proportion of adult life in retirement (in 2028-29), under ONS 2014-based principal population projections and adjusted long-term improvement rates*

Central long-term improvement rate	Cohort life expectancy at age 65				Proportion of adult life in retirement*
	Men		Women		
% pa	2014	2064	2014	2064	(2028-29)
0% (low)	20.3	20.9	22.5	22.8	30.0%
1.0%	21.0	25.3	23.3	27.3	31.6%
1.2% (principal)	21.2	26.7	23.5	28.7	32.0%
1.4%	21.3	27.6	23.6	29.6	32.3%
2.4% (high)	22.2	34.8	24.6	36.9	34.4%

* based on the currently legislated SPa timetable

7.34 This shows that when varying the long-term improvement rate by 0.2% pa in either direction, although the differences in cohort life expectancies at age 65 in 2014 are relatively small (around 0.1-0.2 years), the cumulative effect of the long-term improvements result in much greater differences in life expectancies at age 65 in 2064 (around 1-1.5 years). This level of variation has a significant impact on the calculated proportion of adult life in retirement and hence the resultant calculated Spa timetables, as illustrated above.

7.35 By comparison, when varying the long-term improvement rate by 1.2% pa in either direction, as under the high and low variant projections, the differences in cohort life expectancies at age 65 (in both 2014 and 2064) are much greater, which has a correspondingly greater impact on the calculated proportion of adult life in retirement and hence the resultant calculated SPa timetables, as illustrated above.

Other material factors

Specified age

7.36 As outlined in section 5 of this report, I have been instructed that for the purposes of this report, the "specified age" at which a person's adult life is assumed to begin should be 20. This is more of a policy assumption, less driven by statistics and experience, than the mortality assumptions discussed previously and therefore my report does not include details of how the results would change if a different value for this parameter was used.

7.37 It is useful for context to note that the results of the calculations are particularly sensitive to the choice of this parameter and that the calculated SPa timetables under each scenario would be somewhat different if an alternative specified age were used instead.

7.38 However, if a different parameter for the start of adult life was chosen, then this could also affect the selected parameter for the specified proportion of adult life in retirement. This is because the choice of values for the specified proportion used in this report had regard to the average proportion of their adult life people reaching age 65 in recent years were expected to spend above this (see paragraph 4.8) and any change to the assumed start of adult life would have a knock-on effect to this calculation.

7.39 Therefore, whilst changing the parameter for the start of adult life in isolation would impact on the calculated SPa timetables, if the specified proportion of adult life in retirement was also changed correspondingly then the net overall effect on the calculated SPa timetables would be much reduced.

Specified proportion of adult life in retirement

7.40 As can be seen from the results set out in sections 6 and 7, the calculations are very sensitive to the choice of the parameter for the specified proportion of adult life in retirement. I have also not conducted any further analysis of how the calculations would vary if different values for this parameter were adopted, other than the two scenarios specified in the Terms of Reference of 33.3% and 32.0%.

8 Old age dependency ratio

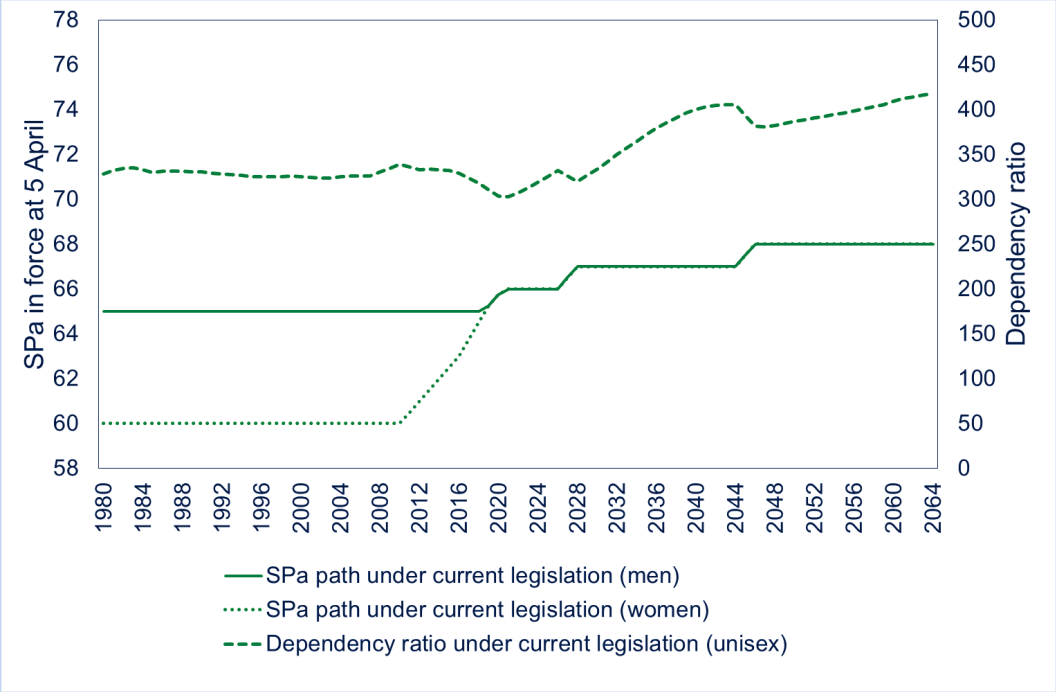
8.1 I have been asked to include information in this report about the potential impacts on old age dependency ratio (OADR) of changing the SPa timetable.

8.2 The OADR measures the proportion of people above SPa compared to the number of people of working age. The OADR provides an idea of the relative relationship between the working age and pensioner populations, illustrating how the proportion of people that may be working, paying taxes and providing care in society compares to the number of people in retirement.

8.3 The OADR is a fairly crude measure, simply looking at relative numbers of people above and below SPa. Whilst this can be helpful in illustrating some of the issues around long-term affordability, it does not consider other relevant factors such as the size and earnings of the workforce compared to the amount of State Pension provided to pensioners.

8.4 The graph below shows how the OADR has changed since 1980 and how it is projected to change over the period to 2064, based on the ONS 2014-based principal population projections and the changes to SPa which are currently legislated for. The graph shows how many people are aged SPa and over for every 1,000 people of working age (where working age is assumed to start at age 20, consistent with the specified parameter set out in section 4 of this report).

Figure 14: *Projected old age dependency ratio and SPa timetable under current Spa legislation, 1980 to 2064*



8.5 This shows that the OADR remained relatively stable from the 1980s until the early 21st century, when it began increasing slightly as those born in the post-war baby boom era started reaching SPa. However, as a result of the increases to SPa for women which have taken place since 2010, and future planned SPa increases for both men and women taking place under current legislation, the OADR is projected to reduce again and to remain relatively stable until the late 2020s, when SPa is due to have completed the increase to 67 (and which is the start of the projection period covered by this report). Thereafter, based on current legislation for SPa increases and based on the ONS 2014-based principal projections, the OADR is projected to start increasing rapidly to reach over 400 by 2064 (the end of the projection period covered by this report).

8.6 If the relative level of the State Pension increases over the long-term compared to the average level of earnings in the workforce – as would be expected to be the case under the "triple lock" policy (whereby the State Pension increases each year at the highest of average earnings growth, price inflation and 2.5%) – then the State Pension will become increasingly more expensive to provide even if the OADR is stable, all other things being equal.

8.7 An increasing OADR would therefore further exacerbate the affordability levels. It should be remembered that there is no substantial "fund" built up to provide future State Pension benefits – the funds required for meeting the cost of these benefits are effectively met from National Insurance contributions, and the bulk of National Insurance contributions paid in any given year are essentially used to meet benefit expenditure in that year. Therefore, to the extent that future State Pensions cost more, this will be ultimately be paid for by future generations of workers.

8.8 The future path of the OADR is largely driven by the shape of the population. The graphs below illustrate how the UK population was distributed by age in 2014 (at the point of the most recent ONS population projections) and how this is expected to change in the proceeding 25 years as the population ages.

Figure 15: *UK population distribution by age, 2014*

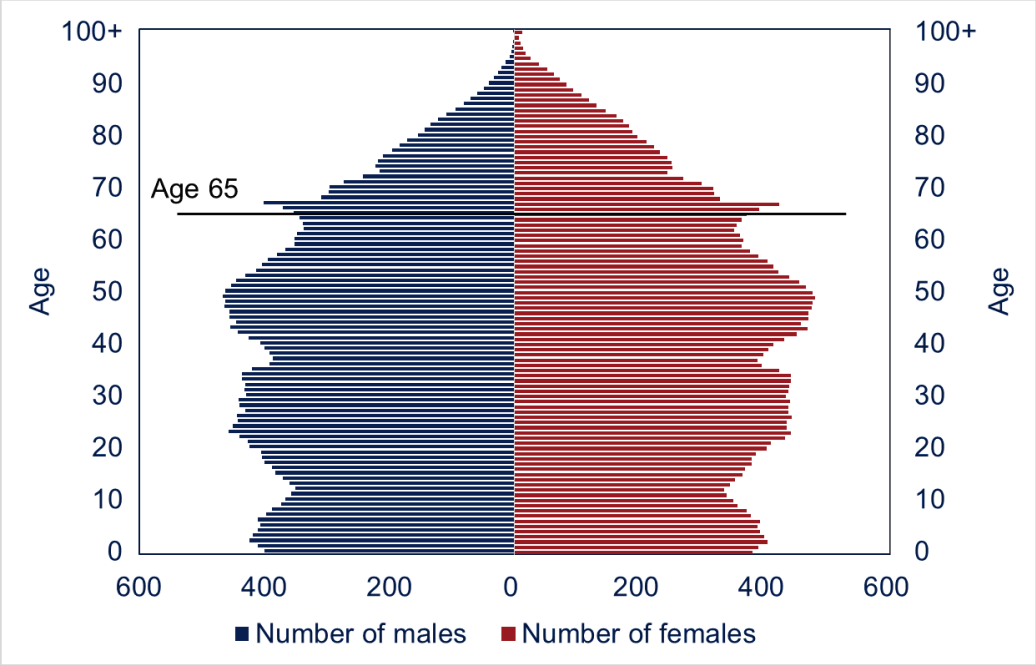
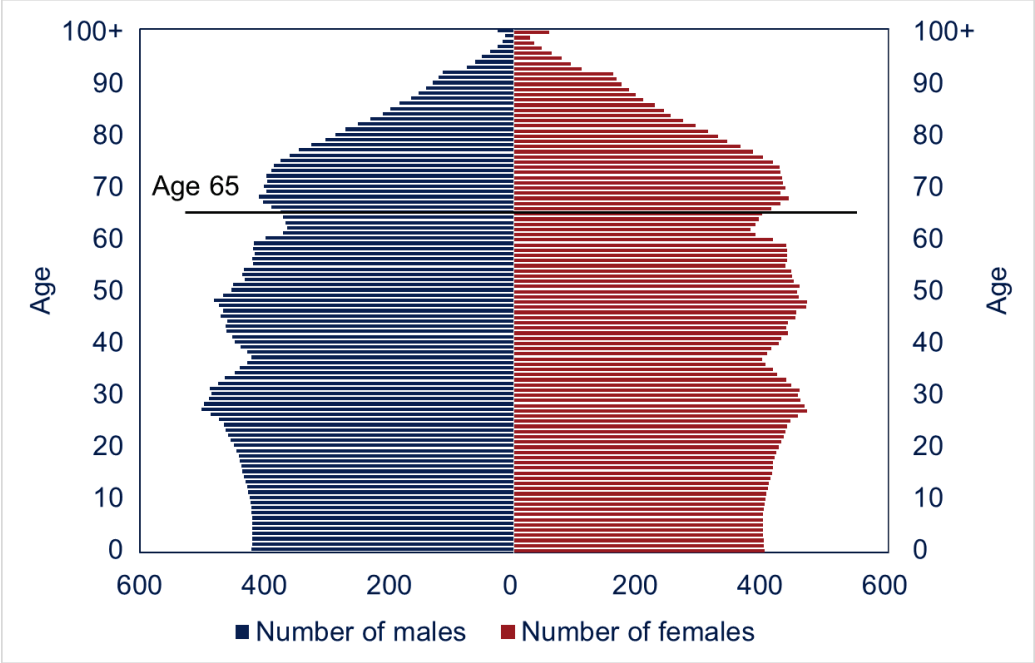


Figure 16: *UK population distribution by age, 2039 (projection)*



Source: ONS. Numbers of individuals at each age are shown in thousands.

8.9 This shows that the shape of the UK population by age is expected to change significantly over the next few decades, with an increasingly higher proportion of individuals aged above 65 (current male SPa). This is a key reason why the OADR is expected to increase substantially over this period.

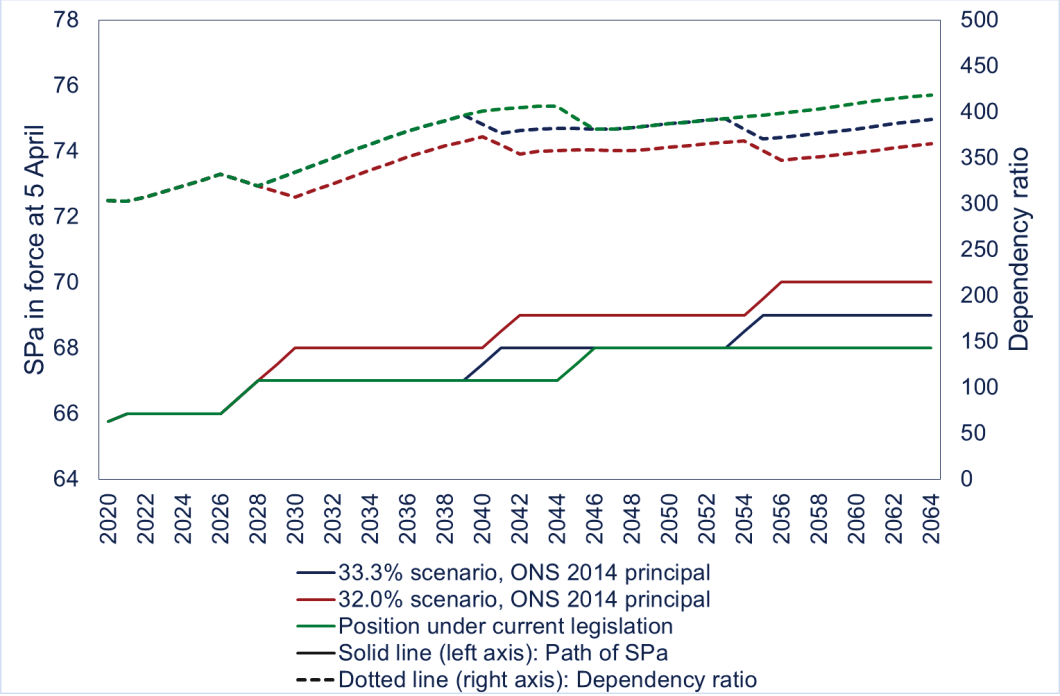
8.10 The OADR is also affected by other factors which affect the shape of the population – for example, rates of fertility and net levels of migration, which typically show even greater uncertainty and volatility than mortality rates.

Impact of changes to SPa timetable on OADR

8.11 Any changes to the SPa timetable introduced following this SPa review which accelerate the timetable for increases to SPa beyond 2028 will serve to reduce the long-term projected OADR, all other things being equal.

8.12 Under the possible SPa paths outlined in section 6 for each of the two scenarios, the future OADR is expected to vary as shown by the graph below.

Figure 17: *Projected old age dependency ratio and calculated SPa timetables under specified parameters and assumptions, 2020 to 2064*



8.13 This graph shows that under either proposed scenario, the long-term OADR would be lower than the position under current legislation. However, there is still expected to be a large increase in the OADR from its current levels over the projection period, particularly during the 2030s, despite the proposed accelerated increases in SPa under either scenario, primarily due to the changing age structure of the population over this period as highlighted above.

8.14 The projected long-term OADR would be slightly different under the sensitivity results shown in section 7, although the impacts are generally fairly minimal, albeit with somewhat larger differences under the high and low life expectancy variants.

8.15 Whilst the increase to the long-term OADR is partly offset by the projected increases to SPa under each scenario, it should be recognised that increasing SPa alone is unlikely to be effective at maintaining the OADR at its current level. However, as noted above, OADR is a fairly simple measure which does not directly consider levels of affordability of State Pension benefits.

9 Timetable regarding future State Pension age changes

9.1 The Terms of Reference for this report require me to provide information about a timetable regarding future SPa changes. The results set out in section 6 of this report illustrate possible timetables for future SPa changes over the period from 2028 to 2064, for two different scenarios for the specified proportion of adult life in retirement, based on the proposed central assumptions as set out in section 4.

9.2 One important consideration is the projection period covered by this report and the interaction with future SPa reviews. The government's first SPa review, due to be finalised before 7 May 2017, only considers changes to SPa from April 2028 – consistent with the government's stated intention that it will give at least 10 years' notice of any SPa changes – with the projection period covered by this report extending all the way to 2064. However, the next SPa review is due to be carried out within 6 years of this one, that is by no later than 2023, and so the projection period for the equivalent Government Actuary's report for the next SPa review will therefore have significant overlap with the projection period covered by this report.

9.3 The sensitivity analysis in section 7 shows how the calculated SPa timetable according to the prescribed formula can vary according to which ONS population projection is applied. This highlights that relatively small changes in either the short-term or long-term mortality assumptions can have a significant effect on the calculated SPa timetables. Hence, the calculated SPa timetables in the Government Actuary's report for the next SPa review may be somewhat different to those outlined in this report.

9.4 For these reasons I consider it prudent, in my proposed SPa timetables set out below, to provide only broad indicative dates for future SPa increases where those increases are in the later years of the projection period covered by this report.

Possible SPa timetables

33.3% scenario

9.5 Under the 33.3% scenario, a possible SPa timetable might be as follows:

- increase in SPa from 67 to 68 expected to take place over a two-year period in the late 2030s or early 2040s;
- increase in SPa from 68 to 69 expected to take place over a two-year period in the 2050s;

32.0% scenario

9.6 Alternatively, under the 32.0% scenario, a possible SPa timetable might be as follows:

- increase in SPa from 67 to 68 to take place over the two-year period from 2028 to 2030 (following on immediately after completion of the increase in SPa from 66 to 67);
- increase in SPa from 68 to 69 expected to take place over a two-year period in the early 2040s;
- increase in SPa from 69 to 70 expected to take place over a two-year period in the 2050s.

Other options

9.7 It should be recognised that the government has not committed to follow either the 33.3% or 32.0% scenarios set out in this report, and is considering future changes to SPa both in the context of this report and the separate independent report being prepared by John Cridland. The final decision on changes to SPa may therefore be different from any of the scenarios in this report and may allow for other considerations such as those outlined in this report and elsewhere.

9.8 Clearly a number of other options are possible, and the parameters and assumptions set out in this report could be varied further. I would be pleased to carry out further calculations to illustrate the effect on the future SPa timetable of different parameters and assumptions being adopted under the prescribed formula.

Appendix A: Terms of Reference (issued by DWP)

Report by the Government Actuary - Terms of Reference

1. Purpose

The purpose of the report on State Pension age (SPa) by the Government Actuary is to analyse whether those reaching State Pension age in a future specified period can expect to spend a specified proportion of adult life in receipt of State Pension based on the current legislated timetable and, if not, to propose how the State Pension age timetable should change to deliver this[1].

2. Background

From the 1940s until April 2010, the SPa was 60 for women and 65 for men.

Legislation to increase the SPa:

- **Pensions Act 1995** – provision to equalise the SPa for men and women by increasing the SPa for women from 60 to 65 between April 2010 and April 2020.
- **Pensions Act 2007** – provision to increase the SPa to 66 over two years starting from April 2024, to 67 over two years starting in April 2034, and to 68 over two years starting in April 2044.
- **Pensions Act 2011** – provision to bring forward the increase from 65 to 66 between December 2018 and October 2020. To achieve this, the Act brought forward the increase in women's SPa, so that it reaches 65 by November 2018.
- **Pensions Act 2014** – provision to bring forward the increase in the SPa to 67 to between April 2026 and April 2028. People born after 5 March 1961 but before 6 April 1977 have a SPa of 67.

The government has introduced a regular and structured method for considering future changes in SPa by introducing, under section 27 of the Pensions Act 2014, the requirement for regular reviews by the Secretary of State. These reviews will take place every Parliament, with each report published within six years of its predecessor.

The first review is taking place this Parliament, and the Secretary of State is required to publish his report on the review before the 7th May 2017.

The Secretary of State's review of the SPa will be based on the principle that people should expect to spend a given proportion of their adult lives receiving a State Pension and will take into account reports from:

- the Government Actuary's analysis of the proportion of their adult life that individuals in the future can expect to spend receiving State Pension; and
- an independently-led body, commissioned to produce a report on the wider factors that should be taken into account when setting SPa, such as variations in, for example, healthy life expectancy, and differences in life expectancy between socio-economic groups. The independent review is due to report by March 2017.

[1] See Appendix A.

Any future changes to SPa will, as now, require primary legislation and will be subject to the full scrutiny of Parliament. Any such changes will seek to give individuals affected by changes to their SPa at least 10 years' notice from their expected SPa.

The Government review of SPa is forward looking and will not make recommendations for any changes to happen before 2028.

3. Scope of the report

The Secretary of State for Work and Pensions requires the Government Actuary to analyse and report whether those reaching SPa in a specified future period can expect to spend specified proportions of adult life in receipt of State Pension based on the current legislated timetable and, if not, how the SPa timetable should change to deliver this.

This report should include:

- Commentary on trends in life expectancy data;
- A timetable regarding future SPa changes;
- Impacts on old age dependency ratios;
- Appropriate sensitivity analysis.

4. Methodology & Assumptions

The proportion of adult life spent in receipt of State Pension based on life expectancy at SPa can be expressed as

Proportion of adult life spent in receipt of State Pension =
(Life expectancy at SPa) / (Life expectancy at SPa + SPa – adult life starting age)

The proposed methodology provides that SPa completes any increase in the year in which the proportion of adult life spent in receipt of State Pension at the existing SPa first reaches the proportion set by Secretary of State (to the nearest 0.1 per cent).

However, increases in SPa do not happen instantly, but are phased in over a period of time to ensure a smooth transition. Government has chosen to retain the phasing-in process adopted for the proposed increase to SPa of 67, which takes place over two years, and so the transition to SPa of 68 would begin two years before the proportion of adult life spent drawing a State Pension at 67 would reach the desired percentage to the nearest 0.1 per cent. For modelling purposes, in the event that consecutive increases in SPa were necessary in order to reach the desired percentage of adult life over SPa, it should be assumed that the second two year transition period would follow directly after the first, with no gap between them.

There are a number of variables that feed into the above formula, including:

Age when adult life begins

Details of the core principle to guide the review were set out by DWP alongside Autumn Statement 2013.[2] The DWP background note stated that the age of 20 should be used as the starting age for the purpose of calculating the proportion of adult life spent in receipt of State Pension. This is based on OECD convention and is commonly used as a comparator for matters relating to pensions. The Government Actuary should therefore consider 20 as the age at which adult life begins.

Measurement of life expectancy

The principal projections of UK cohort life expectancy[3], published by the Office for National Statistics every two years, allow projected life expectancy at any age to be calculated. The Government believes that these projections are the appropriate ones for the purposes of the SPa report by the Government Actuary.

Government believes that although life expectancies between the sexes remain different (but are converging), the appropriate measurement must consider life expectancies for the population as a whole with men and women taken together. Therefore, the average "life expectancy at SPa" for use in the Report should be calculated using probabilities of death at each age and in each year, weighted for the different numbers of men and women in the population at the relevant age and year.

Life expectancies will be based on the age exact as at the middle of the calendar year that falls in the financial year in question.

Specified period

The report by the Government Actuary will suggest a timetable regarding future SPa changes from 2028/29 as far as the published ONS figures (2064).

Specified proportion of adult life spent in receipt of State Pension

The DWP background note published at Autumn Statement 2013 set out details of the core principle to guide the review: that people should expect to spend 'up to one third' of their adult life drawing a State Pension, to reflect the experience of the most recent generations. The Government Actuary should consider two scenarios:

- 33.3%, the maximum possible under the 'up to a third' principle, and the assumption that OBR have used in spending projections since 2013; and
- 32.0%, to reflect the average amount of their adult life people reaching 65 (male SPa) in the last twenty years (between 1996 and 2015) were expected to spend above this.

Geographical Coverage

The analysis will be for the United Kingdom as a whole.

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[2] For further detail see Department for Work and Pensions (2013), *The core principle underpinning future State Pension age rises: DWP background note*, December

[3] The Pensions Commission (2005) recommended that official publications use the cohort measurement of life expectancy when describing current and future trends in longevity.

Sensitivity analysis

The Government Actuary is invited to conduct appropriate sensitivity analysis, including, but not limited to:

- analysis based on high and low life expectancy variant projections;
- analysis of the likelihood of upward and downward revision of life expectancy forecasts to reflect recent fluctuations in ONS life expectancy projections, and its effect on SPa timetables;
- any other factors which may be material.

5. Deliverables

The expectation is that the report by the Government Actuary will be finalised by January 2017.

This report will state whether those reaching pensionable age in the specified future period can expect to spend specified proportion(s) of adult life in receipt of State Pension based on the current legislated timetable and, if not, how the SPa timetable should change to deliver this.

Appendix A Extract from Pensions Act 2014

27 Periodic review of rules about pensionable age

(1) The Secretary of State must from time to time -

(a) review whether the rules about pensionable age are appropriate, having regard to life expectancy and other factors that the Secretary of State considers relevant, and

(b) prepare and publish a report on the outcome of the review.

(2) The first report must be published before 7 May 2017.

(3) Each subsequent report must be published before the end of the period of 6 years beginning with the day on which the previous report was published.

(4) For the purposes of each review, the Secretary of State must require the Government Actuary or Deputy Government Actuary to prepare a report for the Secretary of State on -

(a) whether the rules about pensionable age mean that, on average, a person who reaches pensionable age within a specified period can be expected to spend a specified proportion of his or her adult life in retirement, and

(b) if not, ways in which the rules might be changed with a view to achieving that result.

(5) The Secretary of State must, for the purposes of a review, appoint a person or persons to prepare a report for the Secretary of State on other specified factors relevant to the review.

(6) The Secretary of State must lay before Parliament any report prepared under this section.

(7) For the purposes of subsection (4) -

(a) a person's adult life is the part of the person's life after he or she reaches the specified age;

(b) the proportion of a person's adult life spent in retirement is the proportion of his or her adult life spent after reaching pensionable age.

(8) In this section -

"pensionable age" has the meaning given by the rules in paragraph 1 of Schedule 4 to the Pensions Act 1995 (and "the rules about pensionable age" means those rules);

"specified" means specified by the Secretary of State.

Appendix B: Detailed results

The following pages set out detailed tables of the calculation results, illustrating the proportion of adult life in retirement at each tax year of the projection period (from 2028 to 2064) under current legislation and under the 33.3% and 32.0% scenarios, using the specified parameters and assumptions set out in section 6.

Life expectancies and proportions of adult life in retirement in these tables have been calculated based on age exact at the middle of the calendar year that falls in the tax year in question and SPa at the end of that tax year.

Table B1 – under current legislation

Tax year	Currently legislated SPa at end of tax year	Projected life expectancy at SPa	Proportion of adult life in retirement
2028-2029	67	22.1	32.0%
2029-2030	67	22.2	32.1%
2030-2031	67	22.4	32.2%
2031-2032	67	22.5	32.3%
2032-2033	67	22.6	32.4%
2033-2034	67	22.7	32.5%
2034-2035	67	22.8	32.6%
2035-2036	67	22.9	32.7%
2036-2037	67	23.0	32.8%
2037-2038	67	23.1	32.9%
2038-2039	67	23.2	33.0%
2039-2040	67	23.3	33.1%
2040-2041	67	23.4	33.2%
2041-2042	67	23.5	33.3%
2042-2043	67	23.6	33.4%
2043-2044	67	23.7	33.5%
2044-2045	67½	23.3	32.9%
2045-2046	68	23.0	32.4%
2046-2047	68	23.1	32.4%
2047-2048	68	23.2	32.5%
2048-2049	68	23.3	32.6%
2049-2050	68	23.4	32.7%
2050-2051	68	23.5	32.8%
2051-2052	68	23.6	32.9%
2052-2053	68	23.7	33.0%
2053-2054	68	23.8	33.1%
2054-2055	68	23.9	33.2%
2055-2056	68	24.0	33.3%
2056-2057	68	24.1	33.4%
2057-2058	68	24.2	33.5%
2058-2059	68	24.3	33.6%
2059-2060	68	24.4	33.7%
2060-2061	68	24.5	33.8%
2061-2062	68	24.6	33.9%
2062-2063	68	24.7	33.9%
2063-2064	68	24.8	34.0%

Table B2 – under 33.3% scenario as set out in section 6 of this report

Tax year	Required SPa at end of tax year	Projected life expectancy at SPa	Proportion of adult life in retirement
2028-2029	67	22.1	32.0%
2029-2030	67	22.2	32.1%
2030-2031	67	22.4	32.2%
2031-2032	67	22.5	32.3%
2032-2033	67	22.6	32.4%
2033-2034	67	22.7	32.5%
2034-2035	67	22.8	32.6%
2035-2036	67	22.9	32.7%
2036-2037	67	23.0	32.8%
2037-2038	67	23.1	32.9%
2038-2039	67	23.2	33.0%
2039-2040	67½	22.8	32.4%
2040-2041	68	22.4	31.9%
2041-2042	68	22.6	32.0%
2042-2043	68	22.7	32.1%
2043-2044	68	22.8	32.2%
2044-2045	68	22.9	32.3%
2045-2046	68	23.0	32.4%
2046-2047	68	23.1	32.4%
2047-2048	68	23.2	32.5%
2048-2049	68	23.3	32.6%
2049-2050	68	23.4	32.7%
2050-2051	68	23.5	32.8%
2051-2052	68	23.6	32.9%
2052-2053	68	23.7	33.0%
2053-2054	68½	23.3	32.5%
2054-2055	69	22.9	31.9%
2055-2056	69	23.0	32.0%
2056-2057	69	23.1	32.1%
2057-2058	69	23.2	32.2%
2058-2059	69	23.3	32.3%
2059-2060	69	23.4	32.3%
2060-2061	69	23.5	32.4%
2061-2062	69	23.6	32.5%
2062-2063	69	23.7	32.6%
2063-2064	69	23.8	32.7%

Table B3 – under 32.0% scenario as set out in section 6 of this report

Tax year	Required SPa at the end of tax year	Projected life expectancy at SPa	Proportion of adult life in retirement
2028-2029	67½	21.7	31.3%
2029-2030	68	21.3	30.8%
2030-2031	68	21.4	30.9%
2031-2032	68	21.5	31.0%
2032-2033	68	21.6	31.1%
2033-2034	68	21.7	31.2%
2034-2035	68	21.8	31.3%
2035-2036	68	21.9	31.4%
2036-2037	68	22.0	31.5%
2037-2038	68	22.1	31.6%
2038-2039	68	22.3	31.7%
2039-2040	68	22.4	31.8%
2040-2041	68½	22.0	31.2%
2041-2042	69	21.6	30.6%
2042-2043	69	21.7	30.7%
2043-2044	69	21.8	30.8%
2044-2045	69	21.9	30.9%
2045-2046	69	22.0	31.0%
2046-2047	69	22.1	31.1%
2047-2048	69	22.2	31.2%
2048-2049	69	22.3	31.3%
2049-2050	69	22.4	31.4%
2050-2051	69	22.5	31.5%
2051-2052	69	22.6	31.6%
2052-2053	69	22.7	31.7%
2053-2054	69	22.8	31.8%
2054-2055	69½	22.5	31.2%
2055-2056	70	22.1	30.7%
2056-2057	70	22.2	30.8%
2057-2058	70	22.3	30.9%
2058-2059	70	22.4	31.0%
2059-2060	70	22.5	31.0%
2060-2061	70	22.6	31.1%
2061-2062	70	22.7	31.2%
2062-2063	70	22.8	31.3%
2063-2064	70	22.9	31.4%

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